July 1961

Electrical South

a W.R.C. Smith Publication

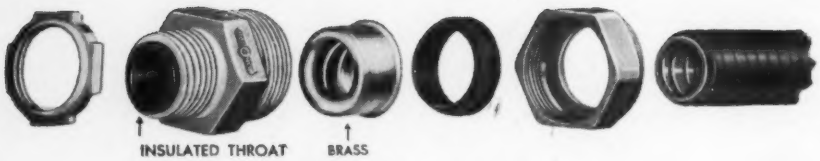
A dram ...uilding will be created for the New York World's Fair

In this issue:

Contractor uses his own headquarters to sell lighting

Application and operation of voltage regulators

Utility engineering section begins on page 47



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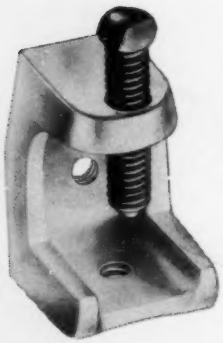
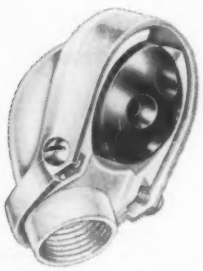


M.I. Beam Clamps

M.I. 90° Corner Adapters and Corner Elbows



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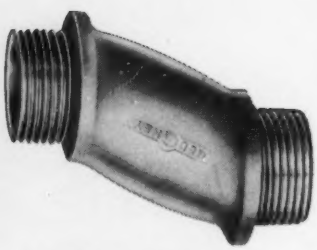
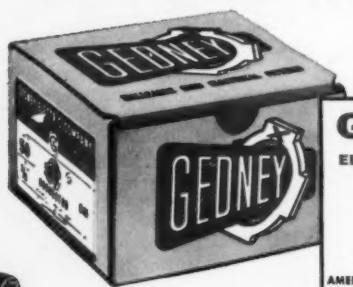


M.I. Offset Connectors and Offset Nipples

M.I. Insulated Bushings



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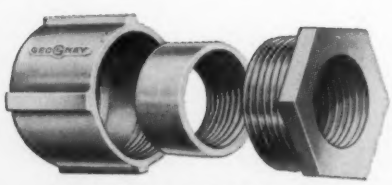

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Vol. 41, No. 7 **July 1961**

Contents

Contractor uses headquarters to sell lighting 24
New lighting possibilities for churches 27
Service brings success to this contractor 28
NECA bookkeeping system lowers accounting costs 30
Maintenance contributes 30 per cent of business 32
Advertising sells service heavy-ups 34
By Charles E. Fink, Fink Electrical Service

Utility engineering

Utility engineering section 47
New impact wrench makes hole drilling easier 48
By C. Clyde Crockett, Louisiana Power & Light Co.
Relay protection for a 24-kv distribution system 50
By W. N. Taylor, Duke Power Co.
System voltage regulation analysis 54
By Arnold L. Samuels, Kansas City Power and Light Co.
High voltage line uses aluminum poles 56
Application and operation of voltage regulators 60
By Thomas J. Sillers, Allis-Chalmers Manufacturing Co.

In every issue

Economic comment 4
By Dr. J. Whitney Bunting
Washington report 10
By Jack James
Catalogs and bulletins 20
Postage-paid inquiry card 21
Contractors tell how 36
Understanding the Code 40
By Walter R. Stone
New electric utility products 64
Helpful literature from manufacturers 72, 88
Estimating data sheets 74
News of the industry 76
Dates ahead 79
News about people 81
Technical books 83
New electrical products 84

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FRONT COVER—A 24-billion candlepower tower of light, expected to be visible from Boston to Washington, D. C., is planned as part of the investor-owned electric utility companies' exhibit at the 1964-65 New York World's Fair. The project was announced by the Edison Electric Institute.

Economic comment

by J. Whitney Bunting, Ph.D.

Contributing Economics Editor

Need for clear thinking

It is often difficult for the average man on the street to recognize the importance of constructive cooperation between business and government.

It becomes even more difficult when every appearance indicates that the two great forces are waging an all-out offensive against each other. Equally difficult to understand is why, under these conditions, business can rise up and work out of recessionary conditions toward an improved economy. The paramount question, of course, is what specific roles in the economy do business and government play.

The government's position over the years has been basically regulatory where evidence of malpractices among business firms has come to light, the result of which would do damage or harm to the public to which it is responsible.

Thus, if businessmen were operating in a manner that reduced the public's opportunity to receive the best in goods and services, then it would be a task of government to establish regulations in the public interest. Or, if products might be detrimental to the public health or well-being, they might be prohibited and the producers punished.

Out of just such philosophy, the Federal Trade Commission, the Interstate Commerce Commission, and the Securities and Exchange Commission were established.

Businessmen as a group have not complained too extensively about any of these agencies nor have they failed to cooperate with them when such appeared to be in the public interest. It is this cooperation between government and business that is essential for the healthy growth of the economic system.

When cooperation disappears and is replaced by a form of coercion by either party over the other, then the hoped-for steady economic growth cannot be achieved. Thus it is imperative that leaders in both government and business circles take time to reappraise constructively the relationships that exist presently.

Business cannot develop if hampered by too many (and too stringent) regulations, particularly when they may work against the public interest they were designed to protect. On the other hand, many regulations, currently in effect, are not enforced and should be for the good of both business and the public as well.

It is very easy to add new regulations to those already established. However, a multitude of restrictive statutes only adds to the confusion of business operation and management, particularly where other steps may be taken with equally fruitful results.

Secretary of Commerce Luther Hodges indicated a worthy goal a short time ago when he advocated the development of a better business moral climate rather than the passage of more restrictive laws. Regulation may not increase the climate of cooperation so sorely needed today if all Americans are to share in a growing economy.

Government is in business

It should not be assumed that government is not "in business" itself for this would be far from the truth. Probably the largest business in the world today is the Federal government with an annual expenditure of many billions of dollars. Many of the tasks which have to be performed in the name of the public are business-natured and thus require business-like operations.

For example, the operation of the postal service and the highway construction program are both business functions of the government, and because the public welfare is so completely involved in both, the job must be performed by the Federal government (with the aid of state and local authorities where appropriate). Since the government performs such services in the public interest, there is no desire for profit as would be found in private business practice.

Unfortunately, many government businesses operate at a deficit, a situation that would be disastrous to private business if allowed to exist. Thus, the business practices of government and business, while similar in some respects, are widely divergent in others. The same procedural yardsticks cannot be used to measure the practices in both areas of economics.

If business and governmental leadership can join together for a thorough study of those business controls necessary for the public interest and can agree on a nonregulatory program to improve the moral climate of business operation, then the way may be cleared for greater government-business cooperation and a true resurgence of American business service and productivity. This is a result that should be attractive to all.

An improving picture

As mentioned earlier, in spite of the confusion resulting from governmental actions, the economic picture continues to brighten although at a relatively slow pace. There is no doubt now that the recession is over and that the nation can look to real economic progress unless suddenly faced by an unforeseen catastrophe.

The improvements in the steel situation as well as fair strength in the automotive field have overcome some of the basic problems that beset the economy during the past 15 months. If these industries continue to show gradual improvement, then other segments of the economy should follow suit to the result that fourth-quarter 1961 will have many prosperous overtones.

There is little expectation that this return to prosperity will have any similarity to an advance of boom proportions. Rather it will continue to produce spotty upturns in a wide variety of fields until business momentum is well established, probably in early 1962.

Dr. Bunting is a well-known economist and educator having special knowledge of the South.

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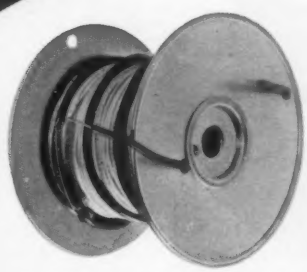

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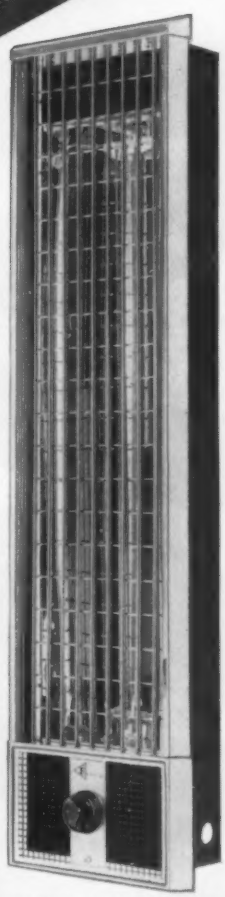

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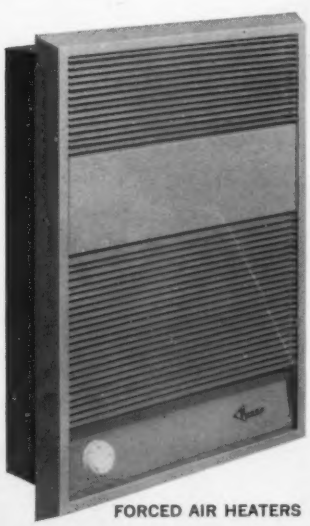

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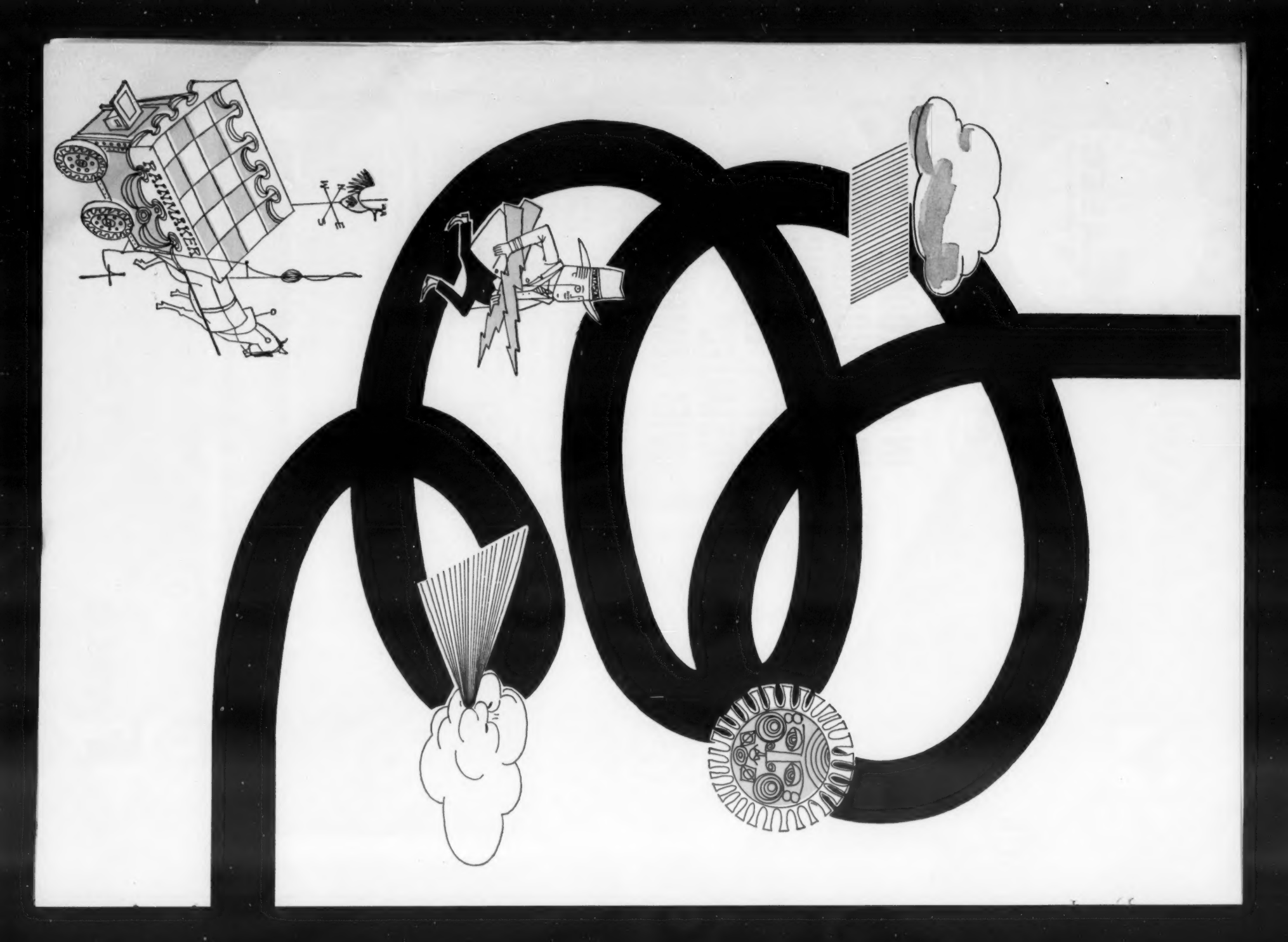
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Washington report

By Jack James

Digest of Washington news of special significance to the electrical industry

New construction value goes ahead of '60 total

VALUE OF NEW construction in May was $4.8 billion, the U. S. Department of Commerce reports.

The amount was three per cent above that for May 1960. Spending on new construction during the first five months of 1961 was estimated at $20.4 billion, slightly ahead of the $20.1 billion put in place during the similar period in 1960.

Economists specializing in construction economics are beginning now to talk about 1961 as another record year. But they are not making predictions public until they see half year figures.

So far this year it has been state, Federal, and local government spending that has given the impetus to the construction industry. All government spending rose 12 per cent through May to $6 billion.

An eight per cent housing decline in the first five months was not offset by increases in commercial and industrial spending. New private construction was off three per cent. The value in the first five months: $14.4 billion.

Controversial housing bill gets approval of Senate

THE SENATE PASSED the Administration's housing bill early in June, and the House was expected to pass the bill late in the month.

Opposition from Republicans and mortgage bankers who feared that the bill might hurt, not help, over the long run brought some compromises in the Senate bill.

Major change was in the Administration's no-down-payment, 40-year mortgage proposal. Mortages would run for 40 years in the Senate bill. But down payments would be three per cent of the first $13,500, ten per cent for the rest up to $15,000. Total down payment on a $15,000 home: $555.

The Senate bill also included: $2.5 billion for urban renewal for a four-year period, a rate double that now in effect; authority for 100,000 more public housing units; $1.35 billion for long-term, low interest rate loans for college dormitories; $50 million loans for local public works; $750 million loans for rental housing for middle-income groups; $150 million loans for planning building and transportation facilities; and authorization of six per cent home improvement loans up to $10,000 for as long as 20 years.

Sen. Capehart (R-Ind.) who has fought for many housing bills said of this one: "I have never encountered such drastic proposals as are contained in this year's bill." He doubted that "our great middle class needs Federal government subsidy in this form to obtain suitable housing facilities."

The Mortgage Bankers Association of America said that the 40-year mortgage proposal "would broaden home ownership at great risk and would undermine the integrity of home buyers and the responsibility of mortgage bankers."

Home builders replied that perhaps as many as one million more families could buy homes if the Administration proposals were passed.

No one denied that there would be a lot more money to finance construction if the Administration proposal became law.

Grand jury charges six makers of line hardware

SIX MAKERS of transmission line hardware were indicted by a Milwaukee, Wis., Federal grand jury, and the chief charge was price fixing.

The firms account for 75 per cent of pole line hardware sales in all but the Pacific Coast states, according to the Department of Justice.

Attorney General Robert Kennedy named defendants as Oliver Electrical Manufacturing Co., Battle Creek, Mich.; Utilities Service Co., Allentown, Pa.; Hubbard and Co., Chicago, Ill.; McGraw-Edison Co., Elgin, Ill.; Joslyn Manufacturing and Supply Co., Chicago, Ill.; and A. B. Chance Co., Centralia, Mo.

The last four companies also were defendants in the heavy electrical equipment conspiracy cases in Philadelphia, according to Mr. Kennedy.

Products listed in the indictment included bolts, braces, cable extension arms, nuts, pins, rods, ridge irons, shims, straps, struts, thimbles, and dead end tongues.

The companies sold more than $30 million a year in equipment, the Attorney General said. The indictment charged that for many years the companies conspired to fix non-competitive prices and uniform discounts and to establish non - competitive distribution practices.

Local refuses required arbitration of renewal

IBEW LOCAL 28 at Baltimore refused to arbitrate a contract renewal as it had done before with the Maryland chapter of the National Electrical Contractors Association.

The old agreement, however, contained an arbitration clause govering contract changes. So the chapter on its own tried to submit the matter to the Council of Industrial Relations for the Electrical Contracting Industry.

The union asked the Federal District Court for Maryland for an injunction to prevent the submission.

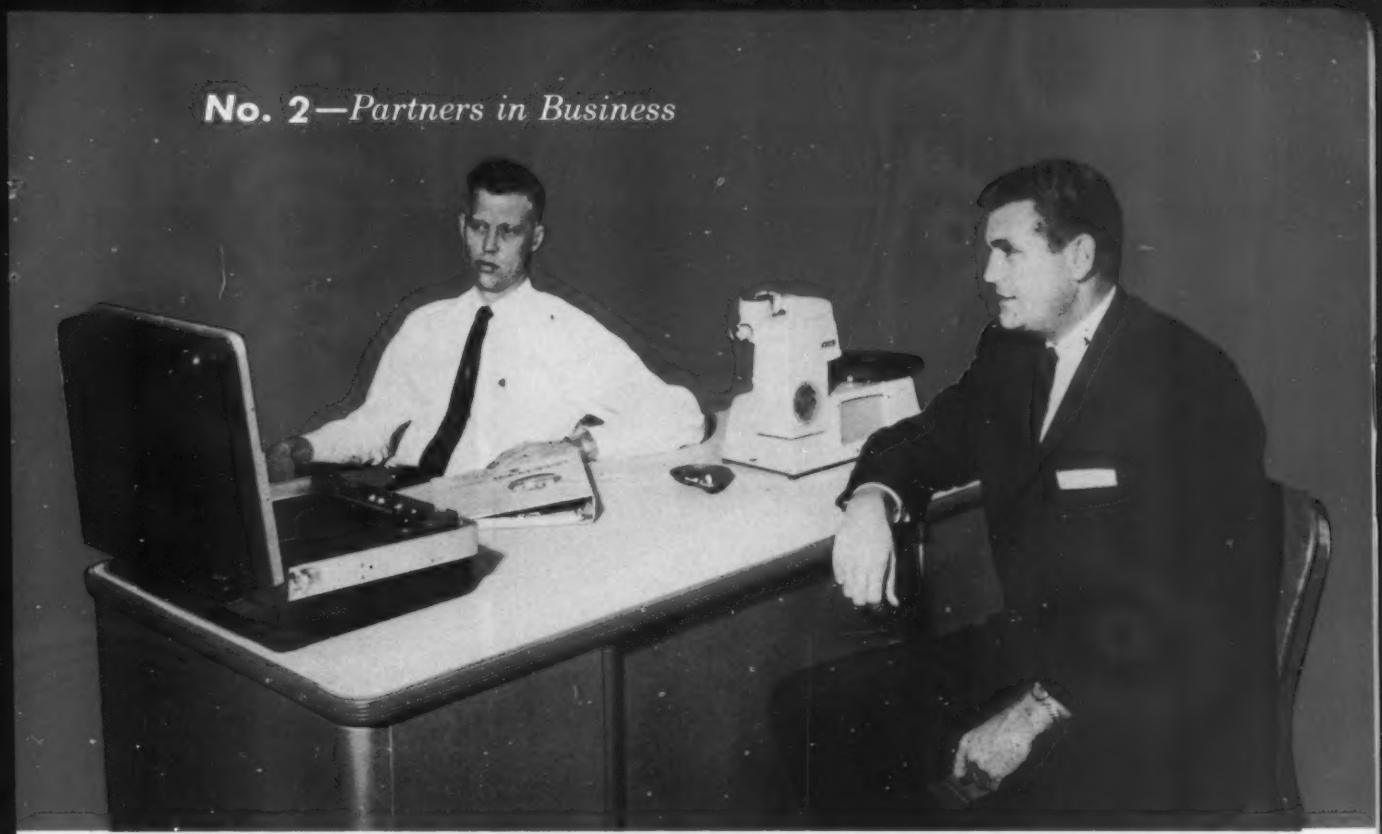
Observing that "Congress has not yet adopted a policy of compulsory arbitration," the Court said that the old agreement placed no limit on the right of either party to end the agreement at the end of any contract year.

The fact that in previous years the union and chapter had submitted to contract arbitration, does not force either to continue this practice, the Court said.

Electrician pay climbs average of 18.7 cents

ELECTRICAL CONTRACTORS in the United States raised pay for union, journeymen electricians an average of 18.7 cents an hour in the 12-month period ending April 3,

(Continued on page 94)



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THE WESTERNER
Fluorescent, rapid start or slimline. Surface or pendant mounted. For continuous row or single unit
THE EXPLORER
Enclosed commercial, 2 and 4-lamp, surface or pendant mounted
THE LP INDUSTRIAL
Fluorescent, Rapid Start. Surface or pendant mounted. Continuous row or single unit
THE PLAINSMAN
Continuous row or single unit. Fluorescent, rapid start, slimline. Surface or pendant mounted
THE PRISLINE
Rapid Start. Two lamp. Surface or pendant mounted. Continuous row or single unit.
THE FALCON LOUVERED
Slimline, Rapid Start: 1 lamp or 2. Surface or pendant mounted. Continuous row or single unit
PENDANT MOUNTED UP-DOWN LITE
Heavy gauge aluminum. Perforated. Non-twist stem, hang straight aligner
SURFACE OR SEMI-RECESSED SQUARE
Vandal-proof, Tamper-proof, Weather-Resistant
CONCENTRIC RINGS
Seamlessly butt welded steel. Heavy gauge aluminum canopy. Aluminum non-reflecting baffle
DOME LITE
Heavy gauge spun aluminum. Available pendant, surface or recessed
BRACKET LITE
Cast aluminum. Moisture and vapor resistant. White opal globe

Here are only a few of the quality fixtures in L & P's complete line of fluorescents and incandescents—everything from open and enclosed commercials, industrials and strips, corridor lights and troffers, to illuminated ceilings, concentric rings, bracket and dome lights, rounds and squares. For beauty, efficiency and economy, order L & P fixtures.

For complete catalog and price lists, write

L&P LIGHTING

Olive Branch, Mississippi

PROTECT YOUR EXPENSIVE OVERHEAD EQUIPMENT WITH

WEAVER GROUNDS

Leading Electric Utilities Specify WEAVER Equipment for Long-lasting, Trouble-free Grounding

GROUND RODS

Heavy, uniform copper coating, molecularly bonded to a rigid steel core, assures permanent grounding. The copper is work-hardened and resists scarring in rocky soil. A special draw gives the core more rigidity and with machined point driving is easier . . . chamfered top eliminates mushrooming and splitting.

GROUND ROD CLAMPS

Cast of high-strength, silicon aluminum bronze, yet cost no more than extruded types of clamps. Design guarantees perfect alignment between ground wire and rod. Big half-inch screw with rounded point gives high pressure contact without damaging the copper on the rod . . . machine-cut threads withstand high torque without stripping or breaking. Available with socket or square heads.

POLE BOTTOM GROUND PLATES

Weaver Plates with 25% more copper area than other types of plates, provide better overload dispersal . . . yet cost no more. It is the only plate with a heavy duty cast bronze connector to give high pressure contact between plate and ground wire . . . assures long-lasting, safe grounding.

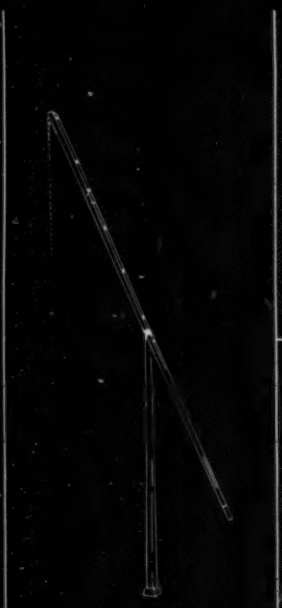
J. A. WEAVER Company

Ask Your Electrical Wholesaler for WEAVER Grounding Equipment

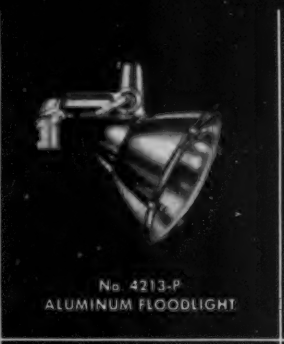
2110 Howard Street • St. Louis 6, Mo. • GArfield 1-6336

For more details on above items, use reply card on page 21

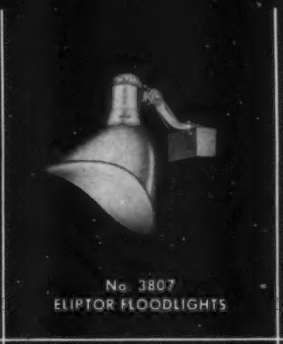
No. 560-30-3 No. 115-40-58
RIGID POLES



No. 199-Series
HIGH STRENGTH HINGED POLES



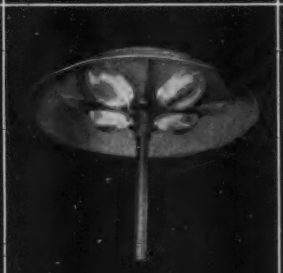
No. 4213-P
ALUMINUM FLOODLIGHT



No. 3807
ELIPTOR FLOODLIGHTS

No. 2001 REAR
SERVICE FLOODLIGHT

No. 4411-P
ECONOMY FLOODLIGHT



No. 5442
ULTRA-LITE

No. 5452
QUAD-OVAL LUMINAIRE

Everything in outdoor lighting equipment from one reliable source

Send for the comprehensive Revere Catalog that lists hundreds of outdoor lighting products, applications and specifications

Revere's 136-page outdoor lighting catalog shows you the industry's widest range of outdoor fluorescent, incandescent and mercury luminaires, as well as poles and accessories. Revere equipment is *design-matched* for best appearance and peak lighting efficiency . . . *structurally-matched* for strength, balance, trouble-free installation and easy maintenance. Write today for your copy of this easy-reference catalog of outdoor lighting equipment.

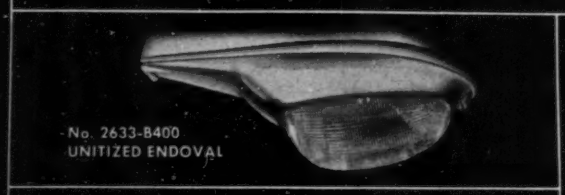
Revere ELECTRIC MFG. CO.

OUTDOOR LIGHTING

Revere Electric Mfg. Co. • 7420 Lehigh Avenue • Chicago 48, Illinois (In suburban Niles)
Long Distance Phone: NI les 7-6060 • Chicago Phone: SPring 4-1200 • Telegrams: WUX Niles

No. 8650 Series
FLUORESIGN LUMINAIRE

No. 9946-V
HIGH LEVEL AREA-LITE



No. 2633-B400
UNITIZED ENDOVAL

No. 2513-B175
UNITIZED URBANOVAL

No. 2274
ENDOVAL

No. 2501-8250
URBANOVAL

No. 6823-NFH
QUARTZOVAL "500"

Bring out the best in Electric Heating with Honeywell quality controls

The new Honeywell T462 Line Voltage Thermostat offers the very finest for your economy-minded customers. A beauty in any room, this compact new thermostat gives dependable, worry-free performance—high load capacity plus accuracy and responsiveness. The new T462 was especially developed for electric heating, with a control range from 40°-85° with less than one-half degree differential. The T462 offers everything you could ask for in a quality-built line voltage thermostat.

Honeywell

First in Control

SINCE 1885

T462A—SPST Switching With Manual Single-Line Break in "No-Heat" Position.
T462B—SPST Switching With Manual Double-Line Break in "Off" Position.
For complete data on these and the complete line of low voltage controls, write Honeywell, Department ES-7-13, Minneapolis 8, Minnesota.

For more details on above items, use reply card on page 21

CONNECTING TWO GREAT LINES

TO BRING YOU BETTER VALUES IN

ELECTRICAL FITTINGS

STEEL CITY

"Biggest name in boxes"

NOW

most complete line of fittings

COMPRESSION

SET-SCREW

INDENTOR

TWO-PIECE

Steel City meets your every need with a complete line of EMT fittings: Complete range of sizes ■ Full range of off-set fittings ■ All fittings accurately sized and fully threaded ■ Heavy gauge steel lock nuts ■

STEEL • PRESSURE CAST • COMBINATION PRESSURE CAST & STEEL

FIRST in boxes . . . now FIRST in fittings . . . and ALWAYS FIRST IN QUALITY

STEEL CITY ELECTRIC COMPANY

Subsidiary of American-Marietta Company

PITTSBURGH 33, PA.

For more details on above items, use reply card on page 21

First from General Electric (1959)...another bright idea that became a better lamp for you

G-E All-Weather Fluorescents shine brighter when mercury drops

Mister Magoo says . . . "1959? A chilly year! Alaska joined the Union, and General Electric invented the All-Weather fluorescent. Happy birthday, All-Weather. Humph! Packaging experts! Who needs a wrapper on a pool cue?"

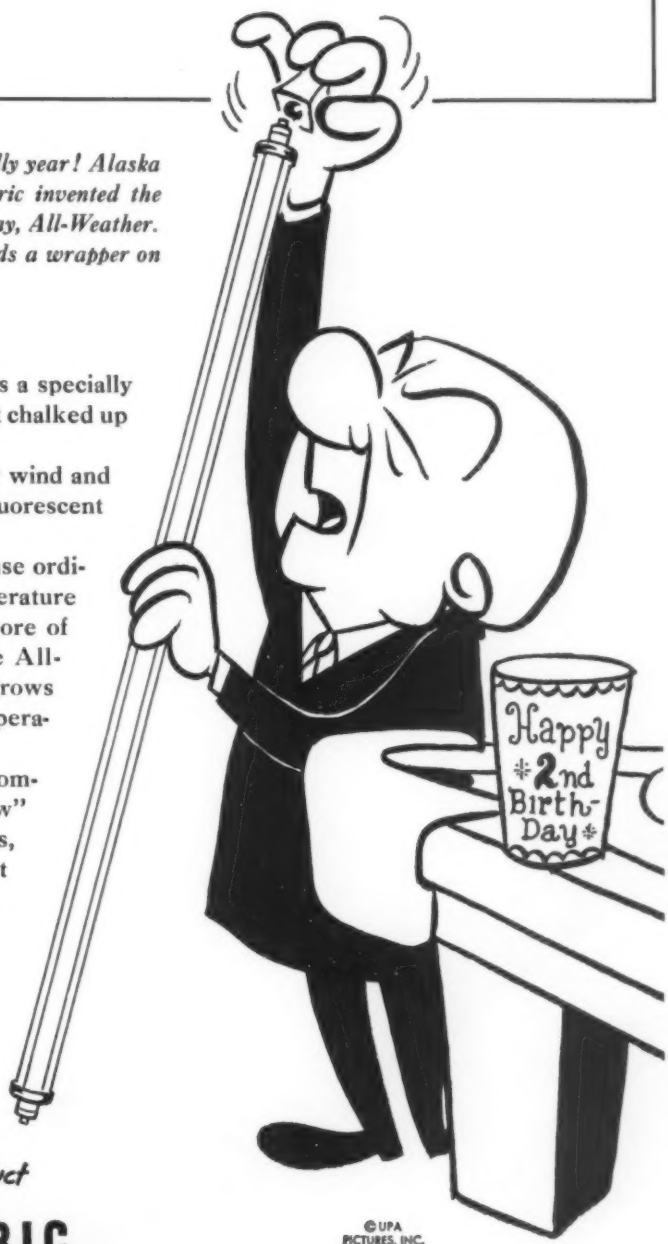
DON'T drop your cue, Mister Magoo. It's a specially jacketed All-Weather lamp, another first chalked up by General Electric.

It wears that glass jacket to ward off winter wind and cold. Below freezing, it's the most powerful fluorescent lamp your customers can buy.

General Electric developed this lamp because ordinary fluorescents grow dim when the temperature dives toward zero. Often they lose 90% or more of their warm-weather light output. But the All-Weather fluorescent T10J—a G-E exclusive—grows brighter the colder it gets! Use it where temperatures sometimes drop below 40°F.

Your customers can use the T10J—or its companion lamp (T10) without the "storm window"—indoors or out. Examples: walk-in freezers, shopping centers, drive-ins, parking lots, street lamps, store fronts, airports, docks, signs, gas stations.

Both come in 4', 6', and 8' lengths. Ask your G-E distributor to show you these two exclusive examples of General Electric lighting leadership. General Electric Co., Large Lamp Dept. C-111, Nela Park, Cleveland 12, Ohio.



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Progress Is Our Most Important Product

GENERAL ELECTRIC

For more details on above items, use reply card on page 21

STEEL

depend on steel conduit from Youngstown—the most complete line in the world

You cut with a steel saw. Bore with a steel drill. Thread with steel. Bend with steel. You use steel so often that you know how good it is. Today, it's better than ever. Steel . . . as strong, familiar, reliable conduit from Youngstown's modern mills.

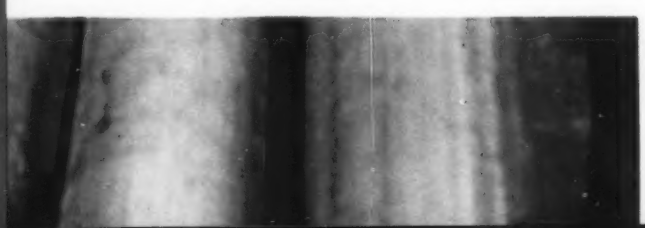
Get Youngstown Buckeye and corrosion resistant Yoloy rigid conduit and EMT. Buckeye for standard installations. Yoloy where corrosion is a problem. Match your needs exactly with the quality Youngstown steel conduit made to meet them.

Choose Buckeye or Yoloy Hot Galvanized conduit. Even the threads are galvanized. Choose Buckeye Electro-Galvanized conduit. Clear enamel interior fishes easier. Choose Buckeye or Yoloy Black Enameled steel conduit. The finish won't wrinkle or crack when bent. Or choose Buckeye or corrosion-resisting Yoloy EMT. Electro-galvanized, coated inside and out with smooth clear enamel.

With any Youngstown quality steel conduit you get easier, kink-free bending. You get smoother threading. Clean, trouble-free handling. Faster fishing. Service masts you don't have to guy. And a modern raceway system that looks as good as it works.

On your next job, specify Youngstown steel conduit. It is readily available in sizes ½" to 6". Get prompt delivery from your electrical distributor.

Youngstown – growing force in steel



For complete information on Youngstown steel conduit, write, Dept. 26-A,
The Youngstown Sheet and Tube Company, Youngstown, Ohio

CATALOGS and BULLETINS

Available Free to Readers of Electrical South upon Request

GENERAL CATALOG — General catalog of Royal Electric Corporation, Pawtucket, R. I., covering flexible, service and lamp cords, cord sets, extensions, trouble lights, wiring devices and fuses is available to wholesalers. Dealers catalogs may be secured from Royal distributors.
Write in No. A101 on card, pg. 21

WIRING PRODUCTS — Various features of J&S Despard interchangeable wiring devices and detailed information covering this line are offered in a brochure released by Pass & Seymour, Inc., Dept. ES, Syracuse 9, N. Y. Included are such features as Camstrap for quick, easy installation, three-wire grounding, and pressure terminal devices.
Write in No. A102 on card, pg. 21

FLUORESCENT BALLASTS—Advance Transformer Co., 2950 N. Western Ave., Chicago 18, Ill., has recently completed the compilation and printing of a 20-page catalog on fluorescent ballasts and their use. Included are data sheets on available Advance ballasts and a comprehensive installation and operation section and testing procedures. Copies of the booklet are available on request.
Write in No. A103 on card, pg. 21

ELECTRICAL TAPES — Plymouth Rubber Co., Inc., Canton, Mass., is offering a new catalog on friction, rubber, and plastic tape. The full color folder gives descriptions, sizes, and packing information on their complete line of Slipknot electrical insulating tapes. Detailed specification data charts are included in the 6-page bulletin.
Write in No. A104 on card, pg. 21

QUARTZ UNIT—Par Light Manufacturing Co., Milan, Ill., has published a four-page brochure on their new 500-watt—120-volt quartz unit featuring the new incandescent quartz lamp made especially for industry, sports, transportation, and commerce.
Write in No. A105 on card, pg. 21

SOLDERLESS FITTINGS—A new 48-page catalog, #61, illustrating the complete line of solderless wire connectors, ground cable, and conduit fittings is now offered by Metalectrics, Inc., 627 Greenwich St., New York 14, N. Y. Designed for insertion in a binder, the booklet features prices and catalog numbers listed side by side.
Write in No. A106 on card, pg. 21

GUTH INDUSTRIAL LIGHTING BROCHURE — New 8 page, 4 color brochure by The Edwin F. Guth Company, 2615 Washington Blvd., St. Louis 3, Missouri, describes Guth KOLORKODED industrial lighting fixtures. This unique innovation of color coding luminaires opens a new field in industrial lighting. Folder includes photographs, lighting data, engineering information and complete descriptive data on KOLORKODED luminaires and standard RLM reflector units. Write for your free copy.
Write in No. A107 on card, pg. 21

SERVICE PANELS — Information on protective electric control centers for homes, apartment buildings, service stations, and industrial applications is contained in Bulletin PM-385, "BullDog Pushmatic Electric-Centers," issued by BullDog Electric Products Co., 7610 Jos Campau, Detroit, Mich.
Write in No. A108 on card, pg. 21

AERIAL CABLES — A 32-page booklet from Southern Electric Co., P. O. Box 989, Chattanooga, Tenn., explains how Compresto Cables and PLM Products, "Wrap Around" spacers can be combined in a compact spaced aerial cable system. Design, voltage drop, sag and tension, and short circuit current are also covered.
Write in No. A109 on card, pg. 21

FITTINGS AND FIXTURES—Information relative to explosion-proof fittings, fixtures, plugs and receptacles, and accessories is available in a 50-page book illustrating the complete line of these products manufactured by Killark Electric Mfg. Co., Easton and Vandeventer Ave., St. Louis 13, Mo.
Write in No. A110 on card, pg. 21

CONDUIT WIREHOLDERS — A new information sheet describing their line of all-purpose conduit wireholders is now available from Knox Porcelain Corp., P. O. Box 2031, Knoxville, Tenn. The illustrated sheet gives installation information, design features, and specifications.
Write in No. A111 on card, pg. 21

CONDUIT FITTINGS—A new 24-page catalog, illustrating a complete line of conduit fittings, oval bodies type LB, LL, LR, and T, and lighting parts is now available from Elliott Electric Mfg. Co., 50-30 98th St., Corona, N. Y.
Write in No. A112 on card, pg. 21

SATURABLE REACTORS — This efficient method of regulating and controlling electric power for various manufacturing processes is described in a new folder available from Sorgel Electric Co., 838 West National Ave., Milwaukee 4, Wisc.
Write in No. A113 on card, pg. 21

POWER SWITCHES—A new bulletin describing its Type PV power switches, is now available from Line Material Industries, Milwaukee 1, Wis. The bulletin gives complete information on switches rated at 600 or 1200 amperes and having voltage ratings from 7.5 kv to 69 kv.
Write in No. A114 on card, pg. 21

MOTOR STARTERS—Design and construction features of their automatic reduced voltage starters are described in a new bulletin released by Allis Chalmers, Milwaukee 1, Wis. Included is motor control engineered for centrifugal compressors, hammer mills, pumps, large conveyors, large fans, motor-generator sets, and other applications.
Write in No. A115 on card, pg. 21

HEAVY-DUTY WIRING—Illustrations and detailed descriptions of 27 types of Circle industrial and commercial wiring products are featured in a four-page folder available from Circle Wire & Cable Corp., 5500 Maspeth Ave., Maspeth, N. Y.
Write in No. A116 on card, pg. 21

CONDUIT FITTINGS — A new catalog describing their line of conduit fittings is now available from L. E. Mason Co., Boston 35, Mass. The illustrated, looseleaf-type folder contains information on design fea-

INFORMATION CENTER

Help yourself to free literature and more details on any products mentioned in this issue.

Instead of writing a dozen different manufacturers for free literature and more information on products, equipment, or services, just insert on the cards below the appropriate key numbers of the items in which you are interested. These cards may be used to get information on products mentioned in the following departments (see Contents Page for page number):

Catalogs and Bulletins
New Utility Equipment
New Electrical Products
Advertisements

Be sure to print or write legibly your name and address—drop it in the nearest mail box and

ES pays the postage!

JULY, 1961

Send free information on these NEW PRODUCTS and/or services (fill in key numbers):

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Send free information on these ADVERTISEMENTS:

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These cards can help you get valuable information

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FIRST CLASS PERMIT NO. 582, SEC. 34.9, P. L. & R., ATLANTA, GA.

Electrical South

1760 PEACHTREE ROAD, N. W.

ATLANTA 9, GEORGIA

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Electrical South

1760 PEACHTREE ROAD, N. W.

ATLANTA 9, GEORGIA

CATALOGS and BULLETINS

Available Free To Readers of

Electrical South

Upon Request

tures, specifications, ordering, prices, and shipping.
Write in No. A117 on card, pg. 21

ELECTRICAL FITTINGS — A 40-page illustrated catalog and price list on the Gedney line. Shown and listed are conduit, threaded entrances, SEC, EMT and ground fittings and box connectors for both armored and non-metallic cables. Copies are available from Gedney Electric Co., RKO Bldg., Radio City, New York 20, N.Y.
Write in No. A118 on card, pg. 21

SWITCH & OUTLET BOXES AND ELECTRICAL FITTINGS — Catalogs B-960 and F-960 respectively feature the latest in switch and outlet boxes and electrical fittings. Completely illustrated, they contain over 100 pages of technical and informational data. A unique set of indexes in the fittings catalog make it the easiest reference catalog in its field. Available from the Electrical Fittings Corp., 37-50 57th St., Woodside 77, New York.
Write in No. A119 on card, pg. 21

STEEL WIRE—Technical information on Alumoweld, a newly developed aluminum-covered steel wire and strand, is contained in a 12-page catalog, just issued by the Wire and Cable Division of Copperweld Steel Co., 322 Frick Building, Pittsburgh 19, Pa. Illustrated and documented with engineering data, the colorful catalog provides a complete working knowledge of this new material—its properties, advantages, applications and construction practices.
Write in No. A120 on card, pg. 21

PRESSURE CONTACT SWITCH—An 8-page folder (101-K) and a 4-page folder (200-EK) are available from the Kelek Company, 59 Davis Avenue, Norwood, Mass., describing their Kam-Lok Pressure Contact Switch, open and enclosed models, respectively, for high-capacity use with current-limiting fuses for 250 and 480 volt service entrance applications from 1200 to 6000 amperes.
Write in No. A121 on card, pg. 21

WIRE PULLING LUBRICANT — Illustrated six-page folder showing the advantages of an improved Y-Er Eas wire pulling lubricant is available from Electro Compound Co., 4145 W. 150th St., Cleveland 11, Ohio.
Write in No. A122 on card, pg. 21

SELECTING FUSES — A 12-page descriptive handbook, Fuseology, tells how to get safest, most dependable, trouble-free electrical protection from fuses. Contains useful information on selecting right size and type of fuses —how to stop needless blows—avoiding poor contact and other troubles. Issued by Bussman Mfg. Co., University at Jefferson, St. Louis 7, Mo.
Write in No. A123 on card, pg. 21

CLAMPS AND STRAPS — Some 600 clamps and straps are listed in a new catalog put out by Victor Specialties, Inc., 775 Main St., New Rochelle, N. Y. Catalog number, size, type, and price are listed for each item in numerical order under general categories. Illustrations are also included.
Write in No. A124 on card, pg. 21

ELECTRICAL FITTINGS—Blackhawk Industries, Dubuque, Iowa, offers a complete catalog of electrical conduit and cable fittings. Also a special publication giving detail drawings and instructions for installing service entrance masts on low or ranch type buildings.
Write in No. A125 on card, pg. 21

LIGHTING PANELBOARDS — A 4-page descriptive folder featuring a line of plug fuse and toggle switch panelboards for lighting control circuits is now available from Frank Adam Electric Co., 3650 Windsor Pl., St. Louis, Mo. The folder includes box sizes, details of construction, wiring gutters, special features, and catalog numbers.
Write in No. A126 on card, pg. 21

ELECTRICAL ENCLOSURES — Catalog Number 6061 currently being offered to the trade by B & C Metal Stamping Co., 590 Means St., N. W., Atlanta 18, Georgia, is a well organized compact 132 page manual. The Catalog is divided into two distinct sections, one covering products for the Utilities, and the other section covering products for the Electrical Contractor. This Catalog offers complete descriptive information, prices, and specifications on all items in the B & C line of Electrical Products and Devices. Copies are available free of charge to Distributors, Contractors, Architects and Engineers, and Utilities.
Write in No. A127 on card, pg. 21

DISTRIBUTION EQUIPMENT — Kuhlman Electric Co., P. O. Box 288, Birmingham, Mich., offers an eight-page catalog, CS-201, describing their line of distribution transformers of the single phase conventional type, 167 kva and below. Also available is an information sheet, CS-204, on the Kuhlman externally operated series-multiple switch for pole-type transformers 5-167 kva.
Write in No. A128 on card, pg. 21

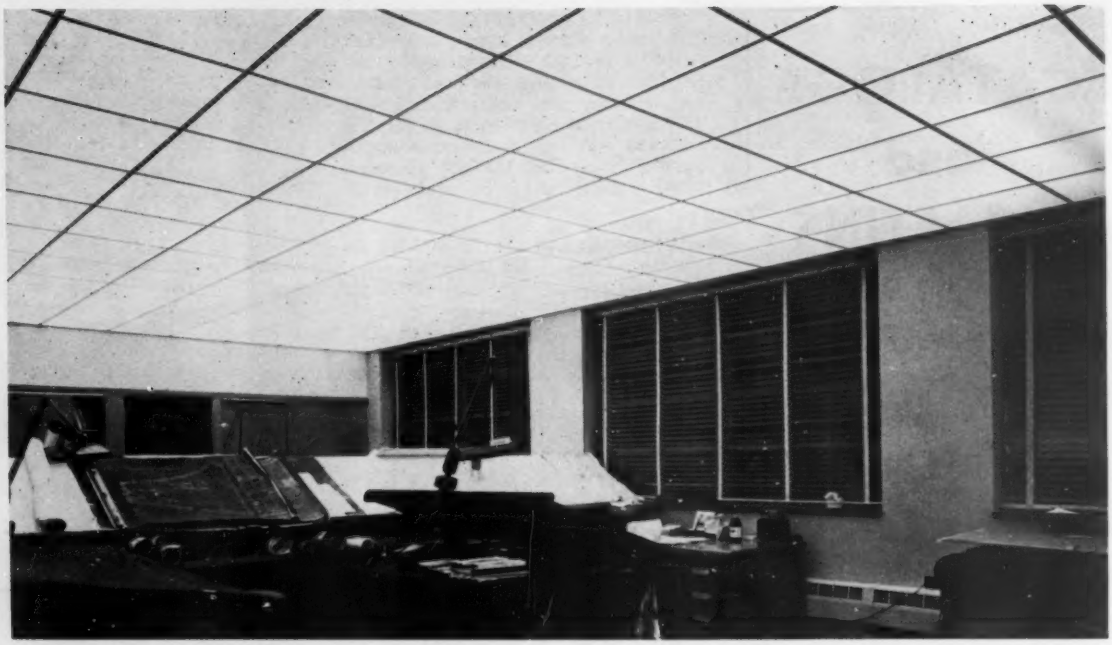
DUAL ELEMENT FUSES—A recently published catalog from Great Western Fuse Div., El-Tronics, Inc., Jamestown, N. Y., gives charts showing load data, as well as diagramed illustrations explaining features of dual element fuses. Ordering information and a cross reference guide of sizes is also included.
Write in No. A129 on card, pg. 21

LAMP GUIDES—Sylvania Lighting Products, 60 Boston St., Salem, Mass., has made available three lamp guides containing general information, technical data, and catalog listings on their lines of fluorescent lamps, incandescent lamps, and mercury lamps.
Write in No. A130 on card, pg. 21

ELECTRICAL ENCLOSURES — Adjustable and non-adjustable floor boxes, watertight outlets for floor use, and conduit hangers are shown in the 20-page revised catalog #750 available from Fullman Mfg. Co., Latrobe, Pa. Adjacent to each photograph in the catalog are specifications for the product pictured.
Write in No. A131 on card, pg. 21

ELECTRICAL TAPES—Eight-page Accurate Tape bulletin details data on rubber, friction and plastic tapes. Bulletin features laboratory test results, includes complete packaging information. Immediately available from Accurate Manufacturing Company, Garfield, New Jersey.
Write in No. A132 on card, pg. 21

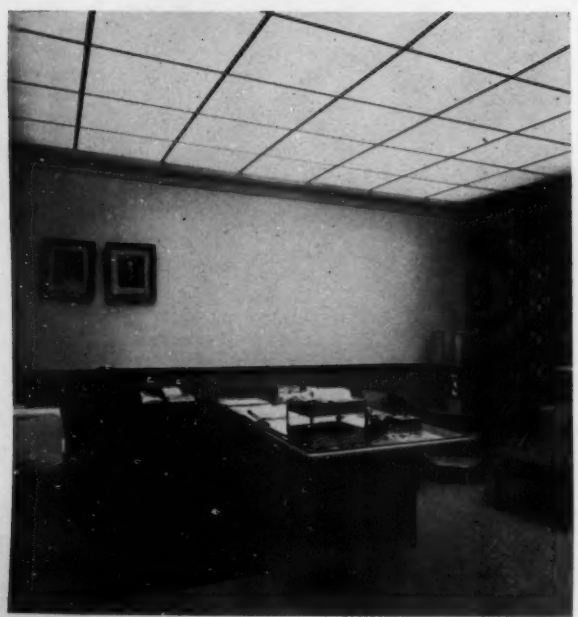
PLUG-IN REELITE — Complete details about Appleton's lightweight, portable automatic Reelites are given in an attractive 4-page catalog insert. These devices find application in a wide range of occupancies: garages, loading docks, garment industry, construction crews, warehouses, machine shops, etc. Write to Appleton Electric Co., 1701 Wellington Ave., Chicago 13, Ill.
Write in No. A133 on card, pg. 21



Throughout the entire drafting room, a 150-footcandle illumination level is maintained on drafting boards.

Contractor uses headquarters

A variety of lighting equipment shows



The ceiling is placed over a cove and can stay dark while the cove is illuminated, producing a restful effect.

Switching can provide either 40, 80, or 120 footcandles for the conference table. Cove lighting cuts contrast.

This shows drafting room ceiling details.

Lighting in this office is supplemented by pinpoint spotlights.

to sell lighting

customers how actual designs look and reveals installation details

This article should be especially helpful to the following readers:

- Electrical Contractors ✔
- Electrical Utilities ✔
- Electrical Wholesalers ✔
- Electrical Inspectors
- Industrial Engineers
- Consulting Engineers ✔

◆ Contractors can often make valuable use of their own facilities to demonstrate and promote ideas and equipment.

For example, a well-lighted headquarters can serve as an excellent means of showing customers what good lighting can do, and how this lighting can be installed.

Following this idea is Sachs Electric, St. Louis, which has just completed the latest expansion of its headquarters. New offices were added and the accounting department and drafting room were increased in size. New facilities were also added for officers and to meet needs of additional office personnel.

Building a new office facility afforded an opportunity to use the latest lighting designs and equipment of different types. The completed structure includes many variations of recessed units, surface- and stem-mounted equipment, cove lights, luminous ceilings, and many other facilities that make for good illumination. In all, 38 different arrangements were used.

The lobby was completely remodeled and the existing surface-mounted fluorescent equipment removed. In its place a circle grid luminous element was installed. Shielded fluorescent strip lights were used above the ceiling to provide good illumination. Above the grid element two spotlights illuminate the bulletin board and wall pictures.

An accompanying photograph, in which a portion of the circle grid was removed, shows details of the fluorescent and incandescent elements. The unit is interspersed with colored plastic chips to break up the monotony of a single large element, over-all light.

Luminous ceilings are also used in the private secretarial area. These consist of prismatic plastic lenses. The lenses are supported by plastic lens T's and problems were encountered with a low ceiling height.

The fluorescent strips had to be placed between the structural bar joists. However, the over-all lighting system is adequate without harsh or objectionable shadows.

Two other luminous ceilings were used: the perimeter being an eggcrate, plastic element while the entire center area is a lens luminous element. The two types of elements are used in one particular office because all air-conditioning and heating ducts are above the ceiling. A way had to

be developed to allow air circulation within the room.

This ceiling is laid on what appears to be a ledge. In reality this is a cove and the ceiling can remain dark while the cove is illuminated, giving an over-all dramatic yet restful effect.

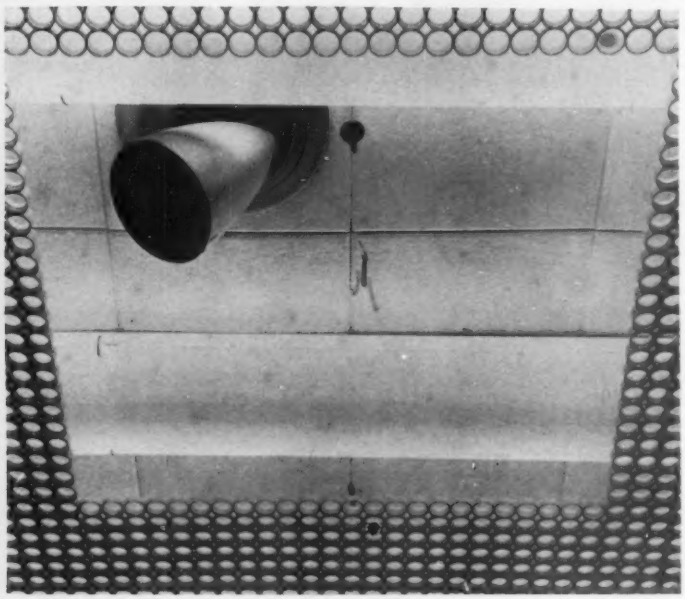
A fourth type of luminous ceiling installed in Sachs' new addition is the plastic eggcrate type with exposed T's, used in the drafting room. At drafting board height—in the entire area—over 150 footcandles are maintained.

Again, because of height, it was necessary to install strip lights between the bar joists. The entire roof bar joists and braces were painted a flat white finish. With the ceiling illuminated, shadows have been entirely eliminated.

An executive office has lens type, recessed, four-lamp fixtures and pinpoint spotlights to illuminate the small table below. With four fixtures in an area approximately 14 by 20 feet an average of well over 100 footcandles is maintained. The area is switched in such a manner that the intensities can be cut in half.

(Continued on page 93)

Colored plastic chips provide an interesting effect in the luminous ceiling over the lobby.



Removal of a two- by two-foot circle grid pattern from the lobby ceiling shows details of the fluorescent and incandescent elements.

Problems were encountered in the secretarial area because of a low ceiling height. Fluorescents had to be placed between bar joists.

A luminous ceiling consisting of prismatic plastic lenses is used in the secretarial area.

New lighting possibilities for churches

Changes in illumination improve two buildings

This article should be especially helpful to the following readers:

- Electrical Contractors ✔
- Electrical Utilities ✔
- Electrical Wholesalers ✔
- Electrical Inspectors
- Industrial Engineers
- Consulting Engineers ✔

◆ Lighting possibilities in religious buildings are demonstrated by two Baptist churches in Texas.

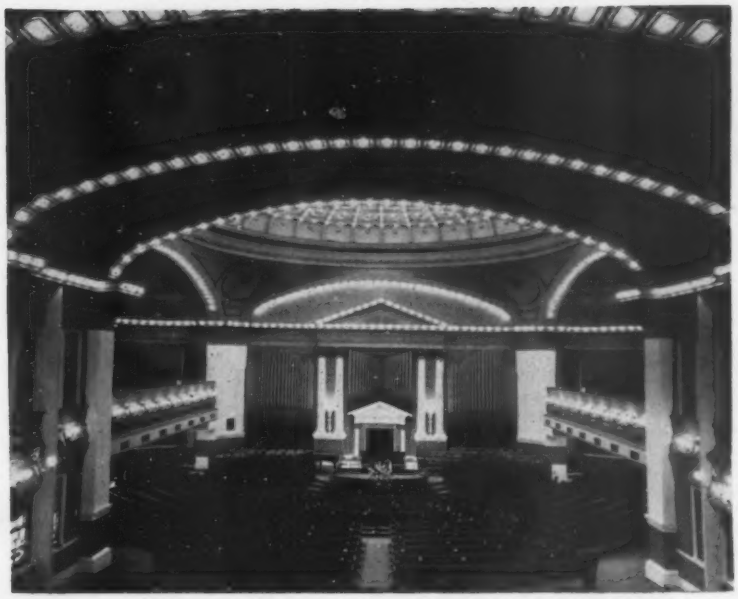
A striking change in the appearance of the First Baptist Church in Waco, Texas, was created entirely by modernizing its lighting system.

Previously the old lighting equipment had been used to outline architectural geometry, incident to providing illumination. Many bare lamps were used for this purpose, and while most of these were 25 watts, their exposed brightness was in the field of view from many locations.

An employee of Dallas Power and Light Co., a member of the congregation, urged a modernization of the lighting system. He advocated the use of architecturally integrated sources which would display the interesting structural forms to full advantage while providing greatly improved seeing conditions.

The new system has created a tremendous change. Recessed parabolic reflectors in the ceiling (150- and 300-watt units) are combined with an upward component from well-shielded sources. The combination contributes a smooth, balanced distribution, free from

(Continued on page 94)



Before modernization, the lighting system of the First Baptist Church in Waco had been used primarily to outline architectural geometry.

The interior of the Waco church is now characterized by a smooth, balanced distribution of light. The installation has earned two awards.

At First Baptist Church in Waxahachie outdoor lighting accomplishes two things: it helps church identification and lights the sidewalks.

Service brings success to this contractor

Owners of commercial establishments such as this one will pay close attention to constructive suggestions from contractors, because these suggestions will make them realize the strong impact that a quality lighting system can have on their customers — and on their business.

Today's electrical contractor needs to sell quality service to his customers in order to upgrade his operations, move ahead of his business competitors

This article should be especially helpful to the following readers:

- Electrical Contractors ✔
- Electric Utilities ✔
- Electrical Wholesalers ✔
- Electrical Inspectors
- Industrial Engineers
- Consulting Engineers ✔

By Harry J. Miller, Electrical South Field Editor, Sarasota, Fla.

◆ Supersalesman Elmer Wheeler's famed slogan, "Sell the sizzle —not the steak!," aptly describes the successful lighting business of Sarasota Electric Corp., Sarasota, Fla.

Says the company's Si Bell: "Today's electrical contractor needs more than ever to develop a professional approach to the field of lighting. He needs to sell quality lighting and quality service and sell these hard if he is to upgrade his operation to professional status and not keep himself wallowing in the morass of competition for wiring alone."

According to him, it is high time that the contractor take a long-range view of every lighting job that comes his way. Ever since adoption of new recommended lighting levels by the Illuminating Engineering Society, industry reaction has spiralled.

The new lighting levels mean higher lighting costs. In addition, they pose the problems of more heat to be handled by air-conditioning systems, coping with heat in ballasts, larger capacity wiring systems, etc.

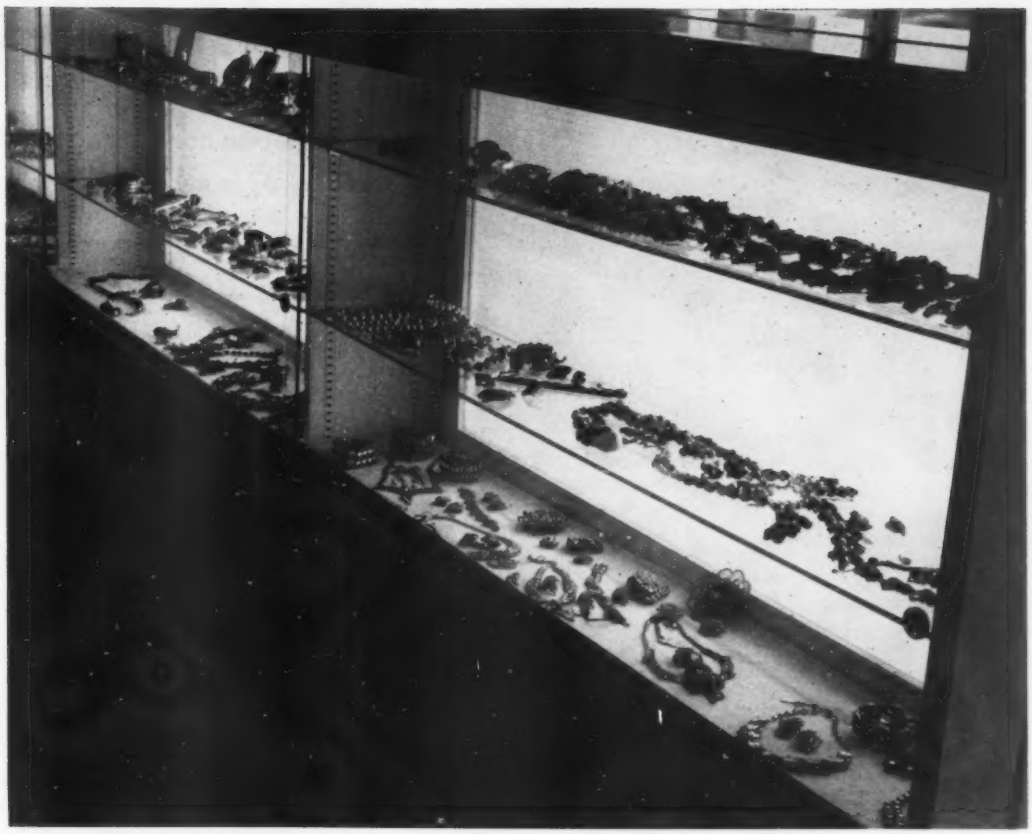
To Mr. Bell, this complication is a challenge. "It means that the electrical contractor should revise his thinking. He must see far beyond the job he's bidding and he must scrutinize it earnestly with a view to coming up with some sensible and constructive ideas and offer them to the owner or architect.

"Some contractors are prone to figure that when they've submitted a bid, won the job, and installed the lighting as scheduled in the specs, and garnered what they feel is a reasonable profit, they've done their duty by themselves and their customer.

"And that's an outstanding and grievous mistake," according to Mr. Bell, whose creative genius in designing magnificent and individualized lighting systems has earned him a number of enviable lighting awards, along with the respect of architects and builders.

Admittedly some contractors are loath to seek out the owner or approach the architect on his professional level.

"But careful examination of the plans and a study of the kind of business for which a lighting system is intended may reveal some aspects of the job that the owner



Contractor Si Bell designed these showcases for a customer who wanted to display jewelry effectively.

or his architect needs to know about," says Mr. Bell.

He feels that the experienced contractor may well uncover some detail or suggest a modification of lighting arrangements that is workable and upgrade the finalized installation.

"Sure, the contractor's ideas may fall upon deaf ears and that may discourage or frustrate him for the time being. But once his ideas are adopted, he's got a foot in the door where it pays him to have a foot in the door."

It is Mr. Bell's firm policy never to make the bid his only consideration. "It pays to take the time to go over the plans carefully. Try to see how you can turn in a better job. Visualize it, consider its potentialities, exercise your imagination, then take your findings to the owner," he says.

He admits that at times this requires stepping outside the accepted pattern of the contractor's operation. For example, in the case of a noted night club for which he designed an award-winning lighting installation, he became at one and the same time the wiring contractor, the designer of special fixtures, and a nurseryman in urging the rearrangement of trees and shrubbery to enhance the overall effect of color lighting.

The net result was a lighting installation far removed from that formerly envisioned by the owner. Perhaps in no other business is it so important to create lighting that is functional, decorative, and a creator of moods that foster hospitality, intimacy, and gaiety.

He also sold the owner on the idea of building a fence to block off an unattractive view.

"Lighting is something you've got to *sell*!" avows Mr. Bell. "Our experience has been that a successful businessman will listen to reasonable suggestions.

"The stark fact is that often an owner will spend more money than he originally contemplated for lighting, if he can be convinced the extra expenditure affords some prime advantages for his enterprise. Net result is a bigger profit margin for the contractor and a better quality lighting installation."

Where it is obvious that too little money has been earmarked for a lighting installation, Mr. Bell goes to see the owner.

"While it may be true that the owner may 'pooh-pooh' any suggestion with the airy statement, 'Well that's what my architect specified, and he oughta' know,' the plain truth is that in some cases the architect doesn't know, because the field of lighting is far closer to the working contractor than it is to the architect at his drawing board," says Mr. Bell.

He stresses the importance of communication between the con-

tractor, the owner, and the architect. "You don't know from the plan alone just what the owner has in mind," says Mr. Bell. "And the only way you can find out is by detailed questioning to reveal just what effect the owner is trying to create, lighting-wise."

Once this is established, Mr. Bell goes over the plans with a fine tooth comb, especially if only the bare bones of a lighting system have been laid out.

Contractor's ingenuity

"That's the time the contractor can use his ingenuity," says Mr. Bell. "Maybe the job calls for a dropped wafflegrid ceiling and expensive recessed luminaires. The contractor can suggest a less expensive woodgrid ceiling, for example, and less expensive fixtures, and the difference in cost can be used in other directions, like more lighting units and a larger service, to upgrade the lighting system in general."

He feels that with the information on lighting available to the contractor from various sources, the contractor faced with a job on which a fixed amount of money has been set aside for lighting, may, upon diligent examination of the plan, see some structural unit that could be built or designed with the specific requirements of the customer in mind, that will entice the customer to invest more money in lighting, which is a long-term investment in profits for any merchandiser.

Such was the case in a fancy "shoppe" Mr. Bell recently wired and for which the owner sought dramatic lighting in showcases designed for display of gold rings, ornaments, and precious stones in his jewelry section.

Says he: "Traditionally, jewelry case lighting has always been a problem. Such cases generally have lighting in the rear, supplemented by a downlight and general illumination provided by a blue-white incandescent with a polished Alzak reflector. This is fitted with cut glass serrations to build up enough of a charge to intensify the sparkle of precious gems."

But the ceiling-suspended fixtures planned for the modernistic store seemed unsightly and threatened its esthetic aura, and Mr. Bell considered that recessed lighting would also be far from effective in showing precious stones to their best advantage.

After studying the plan, he approached the owner. He sold him on the idea of building a special showcase patterned after his design. His idea was to have the case free-standing, and had it built with a lightbox at the rear.

The case called for three sections, and after experimenting with various combinations of fluorescents and incandescents, he decided that fluorescents alone produced a dead-pan effect. On the other hand, the incandescents created hot spots and did not provide an even distribution of light.

In addition, a battery of incandescents produced intolerable heating.

Space limitations prevented supplementing fluorescents with incandescents to diffuse the hot spots over a wider area and space was insufficient to permit use of reflecting media such as foil, mirrors, or polished chrome, etc., to level out the hot spots.

He then installed three 40-watt gold cool white fluorescents and two silver cool whites (40-watt) in each end section of the lengthy display case. In the center section, where diamonds are on display, five 40-watt blue-white daylight fluorescents were installed.

"That way we got the smacking hard brilliance we wanted on the gems without marring the store with an ugly 'perfect' ceiling lighting installation," said Mr. Bell.

In addition, he experimented with various plastics as a cover for the lamp strips. He settled on a special plastic sheet of prism-like structure which creates a diffused interreflectancy that shows off the merchandise as no reflecting medium could have done.

Mr. Bell designed the back of the lightbox on the cases so that they can be removed for relamping.

Owner upped spending

The owner spent more than he or his architect had envisioned for the job. But the success of this installation is attributable to the application of several basic principles of illuminating engineering, resulting in a balance of general and accent lighting with good brightness ratios, in a lighting plan keyed to the kind of jewelry and gifts handled by this merchant.

The job also netted Mr. Bell a lucrative lighting contract with a jeweler down the street. The jeweler came to see the first job and he was sold.

As Mr. Bell concludes, too often

(Continued on page 92)

Bookkeeping

Information concerning jobs underway is easily obtained

This article should be especially helpful to the following readers:

Electrical Contractors ✓
Electrical Utilities
Electrical Wholesalers
Electrical Inspectors
Industrial Engineers
Consulting Engineers

By Bill G. Cox, Electrical South Field Editor, Amarillo, Texas.

◆ The Charles Nelson Electric Company of Lubbock, Texas, has instituted the NECA simplified mechanical bookkeeping system with some startling results.

James Bavousett, office manager, said these advantages became apparent soon after the new system was installed last October:

(1) Timesaving device. Whereas it required a full day to get out a financial statement by manual labor, use of the new system makes it possible to do this in 30 minutes to an hour.

(2) Job costs estimates at the contractor's fingertips. This means exact control of material. "You can tell immediately exactly what has been shipped to a specific job," said the bookkeeper.

"And by the labor material you can tell how far along a job should be at one certain point. It is a big help in estimates of similar jobs in the future."

(3) The automatic bookkeeping system can cut the number of clerical employees from three to one. Some shops, Mr. Bavousett said, have an employee for accounts receivable, another for accounts payable, and a payroll clerk. "This machine system takes the place of all three," he said.

Several national office equipment firms offer the automatic bookkeeping machines, designed for use especially by the electrical contractor.

Since forms used in a mechanical

system from NECA lowers costs

bookkeeping system require more planning and accuracy than would be necessary for forms used in a manual system, all forms applicable to the new system are available through the National Electrical Contractors Association.

Registration is important on all forms used in the duplicating phase of the system; more than one record can be completed at the same time on the machine.

The completely integrated bookkeeping, job record, and cost accounting system enables the contractor to perform his bookkeeping and invoicing and to secure financial information with the highest degree of accuracy and speed.

The mechanical system takes care of the whole works: accounts receivable, accounts payable, the general ledger, payroll checks, payroll records, and job costs.

How it saves time

The timesaving element is shown by these examples given by Mr. Bavousett:

Whereas the firm now has a new balance available at the end of every day, the balancing used to be done once a month.

The bookkeeper said he now posts up to 15 invoices to accounts payable, the suppliers' account, and to job costs—all in five minutes. The old way required at least 30 minutes.

Mr. Bavousett said that for a $50,000 a month business, the bookkeeper will spend only two hours a day doing the bookkeeping work. "Ordinarily, this would take eight hours of hard work a day," he said.

The mechanical system more than pays for its cost just in savings on one year's salaries, according to Mr. Bavousett.

The firm obtained its Monroe bookkeeping machine on a lease-purchase agreement. Total cost of the machine is $2,000, payable $50 a month. After the machine has been paid for, the firm will pay a monthly service charge of $17.

In addition to this initial investment for the machine, Charles Nelson Electric spent $600 for the necessary new forms and paychecks and for a small stand for the filing box kept beside the machine. The paper used in the machine costs $.15 a roll, which lasts about a month.

One card in the file lasts about a year, and replaces 30 sheets in the old-style journal.

The machine is so designed as to give an immediate alarm should a mistake be made, say, in picking up the old balance when posting invoices. The last column on the tabulation sheet will register double zero if no mistake is made;

(Continued on page 93)

After posting invoices on the machine, on which more than one record can be completed at a time, the bookkeeper examines tally sheet for errors.

Three radio-equipped trucks, painted fire-engine red, are sent out with a full day's materials.

Maintenance brings in 30 per cent

Trucks dispatched by radio and uniformed personnel have helped

This article should be especially helpful to the following readers:

- Electrical Contractors ✓
- Electrical Utilities ✓
- Electrical Wholesalers ✓
- Electrical Inspectors
- Industrial Engineers
- Consulting Engineers

By C. Thomas, Electrical South Field Editor, El Paso, Texas.

◆ Established a little over a year ago, Horn Brothers Electrical Contractors, El Paso, Texas, has 35 major maintenance accounts which account for 30 per cent of the firm's total dollar volume.

It is not uncommon for any one of the three servicemen to answer as many as 15 service calls in a working day. The minimum charge is $7.50, plus materials. Thus, $112.50 revenue for each serviceman and truck per day, plus the profit from materials, is not unusual.

Favoring maintenance work as they do, the Horn brothers—Thomas and Robert — have this facet of their operation set up for efficiency and personalized service.

"The three service trucks, with a body designed for the purpose," said Thomas Horn, "are equipped with tools and materials so our servicemen can remain out for an entire day without reporting in for materials. Otherwise, there would be very little advantage dispatching them by radio telephone."

The service trucks, like their other rolling stock, are two-way radio-equipped, and painted fire-engine red.

The service personnel assigned to maintenance work are of prime importance, according to Thomas Horn. "We have found that young men—young men with a friendly personality—are best adapted for this type work. Too, they must be alert."

Possessing these attributes, the servicemen keep the maintenance accounts happy. Once they have made contact, they can often get the go-ahead to attend to certain preventive service work before it runs into a midnight service call, saving the customer from paying the overtime rates, and causing inconvenience for all concerned.

"New maintenance customers are continually being referred to us by our regulars. And they have something more to recommend than our prompt service: for example, our periodic preventive maintenance checks."

Servicemen passing by, unless they are rushing to an emergency, will stop by for a quick hello and a cup of coffee with a regular customer.

"We call these coffee checks. Right now we have a crew of three

(Continued on page 92)

Thomas Horn, seated, shows net returns to estimator and office manager.

The Horn Brothers dispatcher is talking to a customer over one telephone and to a serviceman in his truck on the other.

# of firm's business

to insure a steady growth

Here a serviceman is checking out a day's supply of materials from the warehouse. Maintenance work provides the firm with an assured income.

After completion of his service call, the serviceman is having a cup of coffee with a grocer to check time and materials.

Advertising sells service heavy-ups

As a result, most homeowners are receptive to wiring improvements

This article should be especially helpful to the following readers:

- Electrical Contractors ✔
- Electrical Utilities ✔
- Electrical Wholesalers ✔
- Electrical Inspectors
- Industrial Engineers
- Consulting Engineers

By Charles E. Fink, Fink Electrical Service, Kensington, Md.

◆ National advertising has done a wonderful job in educating the public to the need for more housepower.

It has made the homeowner more conscious of greater demands on his electrical service when appliances, air conditioning, and increased lighting are added. If it were not for national advertising, I believe we electricians would have a more difficult time educating the public as to heavying-up their existing services.

Last year I increased residential heavy-ups by at least 50 per cent. The current year indicates there will be a similar gain.

We do all our selling in the personal contact we make with our customer when he calls us for an emergency. He has blown a fuse, has no lights, the washing machine won't work, or he can't run his air conditioner and washing machine at the same time.

In these cases we explain that he is overloading by using too many appliances on one circuit. We recommend not only a heavy-up but a better distribution of the load. In the older homes we find this occurring on the old 60-ampere services.

Warning the homeowner of overloading a circuit and the hazards involved, we point out that difficulty is likely to increase unless the 60-ampere service is replaced with a 100-ampere service.

We generally recommend a 150-ampere service, and by splitting up the load we point out that immediate problems will be eliminated and the future increases taken care of.

Where kitchens do not have a utility circuit, we advise putting one in. A circuit breaker type of service is recommended in preference to a fuse box.

Each house wiring job may present its individual problem. In the older houses it usually means cutting through heavy walls of old plaster and doing a lot of "snaking" to get wires through.

Some of the newer homes—such as the split levels—present problems of their own. In one split level I recall that it took two men

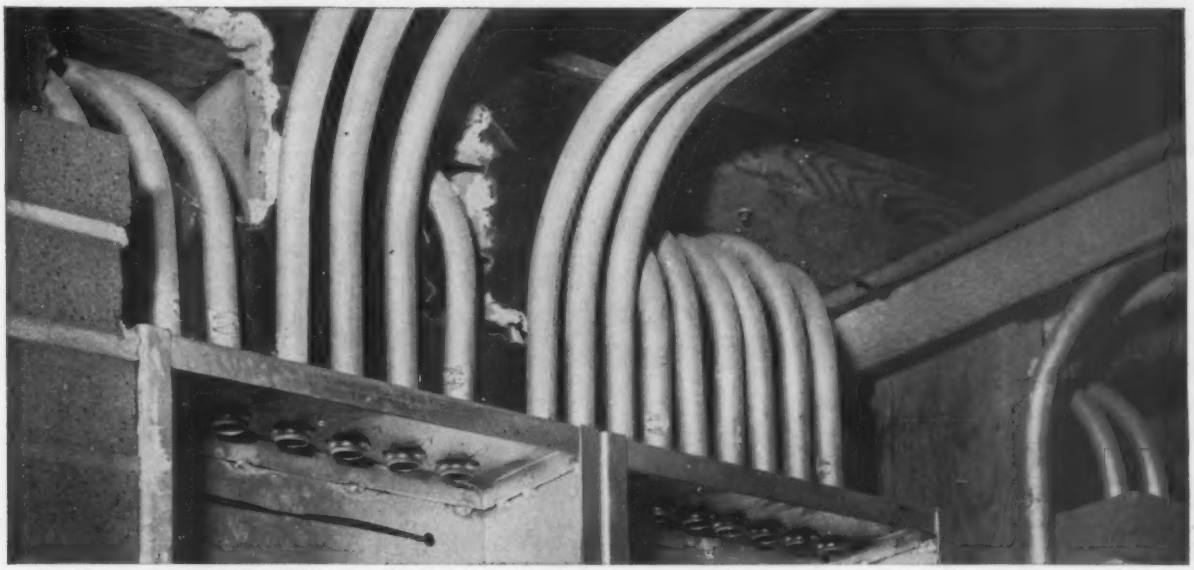
(Continued on page 92)

Mr. Fink shows a homeowner how circuit breakers operate. This heavy-up job allowed a wash machine, fan, and more lighting to be installed.

Here Mr. Fink puts a recessed fixture in the converted basement recreation room.

Houston, Texas,
contractor
says **REPUBLIC**
ELECTRUNITE E.M.T.
ELECTRICAL METALLIC TUBING
makes neater installations at less cost

UNDER CONSTRUCTION
The Carousel Motel, Houston, Texas
Architect: William Tamminga
General Contractor: South Texas Building Company
Electrical Contractor: Todd Electric Company



FULL-LENGTH "GUIDE-LINES" make possible accurate, good-looking bends every time with ELECTRUNITE E.M.T.

Writes S. W. Todd, electrical contractor for Houston's beautiful new Carousel Motel:

"We find that SILVERSLICK® inside finish and the INSIDE-KNURLING® make wire pulling easier and the "INCH-MARKS"® make for easier bending. We find also that the "GUIDE-LINES"® the length of the tubing make it easier to make bends and saddles without getting them out of line.

"We will be pleased to recommend ELECTRUNITE to anyone who wishes to make neater installations at less cost."

See for yourself how Republic ELECTRUNITE E.M.T. can cut installation and wire pulling time, reduce waste, increase your profits. Get ELECTRUNITE from your electrical distributor. You, too, will find "the *best* costs *less* installed."

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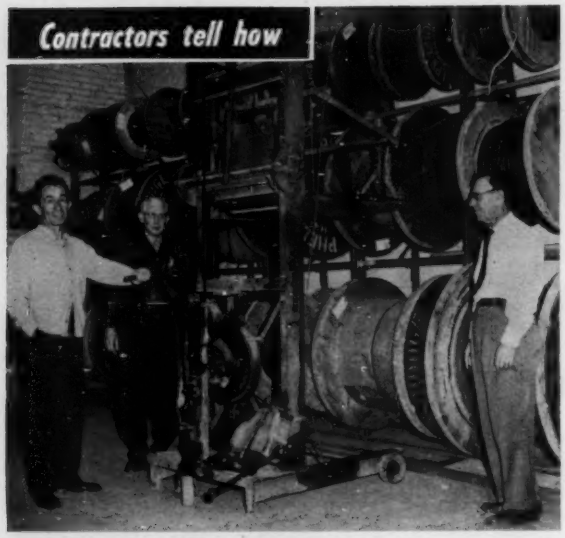
Contractors tell how



Warehouse foreman Joe Cluette, left, is moving a reel into a slot with little effort as F. K. Odle, center, warehouse superintendent, and E. Griffy, Jr., observe him.

It's easy to handle big reels with this special rocker-ramp. A man standing on the back of the ramp can use it as a rocker to assist in moving the reel into place.

Two low cost tools greatly simplify getting reels in and out of storage

By E. Griffy, Jr., Vice-President, Oklahoma Electrical Supply Co., Oklahoma City, Okla.

◆ Handling heavy reels has been a problem for us, as it has been for many contractors.

We have reshuffled our storage area and installed a reel storage system that clears much floor space and makes measurement simple. In the process of handling these heavy reels we have developed two new tools which have made the job of getting reels in and out of the racks much easier.

The reel mounting frame itself was bought ready for assembly, with ready-made axle sockets. And while this addition was a great improvement over our previous methods, the loading and unloading devices we are now using have made the new system even smoother, and the cost to the firm was very small.

Wire reels to a maximum of 48-inches in diameter are mounted on a 20-foot section which houses 26 reels varying all the way from No. 8 to 750,000 MCM. We are completing a second storage section.

The lowest priced hoist would have cost us $800 to $900, and it wouldn't have been ideal for the purpose. But we had a stacker. By modifying this stacker — adding arms with depressions at the end to accept the reel axle, on a rocker system to increase reach and height—we now have a machine that is superior to a fork lift for the purpose. And it only cost $75 to $100 for the modification.

For reels of great weight which we wanted to store in the bottom section of the reel mounting frame, we first built a shallow ramp. The problem here was that we couldn't get the ramp out very easily as we rolled the reels up into place.

By sloping and rounding off the end of the ramp, we ended up with a rocker device. A man standing on the back part of the ramp can use it as a rocker to move the reel right into place. This rocker ramp cost less than $5 to build.

Versatile fluorescent lighting system can change color scheme in sales room

By Ruel McDaniel, Electrical South Field Editor, Port Lavaca, Texas.

◆ Hinote Electric Co., Beaumont, Texas, utilizes a lighting combination in its sales room to boost interest in appliances and aid salesmen in closing the sale to women who are particularly color-conscious.

The large appliance floor is illuminated with a battery of fluorescent lights of three basic colors —white, green, and blue. By utilizing a set of switches beside the desk of the appliance department, it is possible for a salesman to create numerous lighting effects in which to show appliances to advantage.

The lights are behind 28 translucent plastic ceiling panels, each four feet square. Under each panel are three different sets of 48-inch

KNOW YOUR SYMBOLS

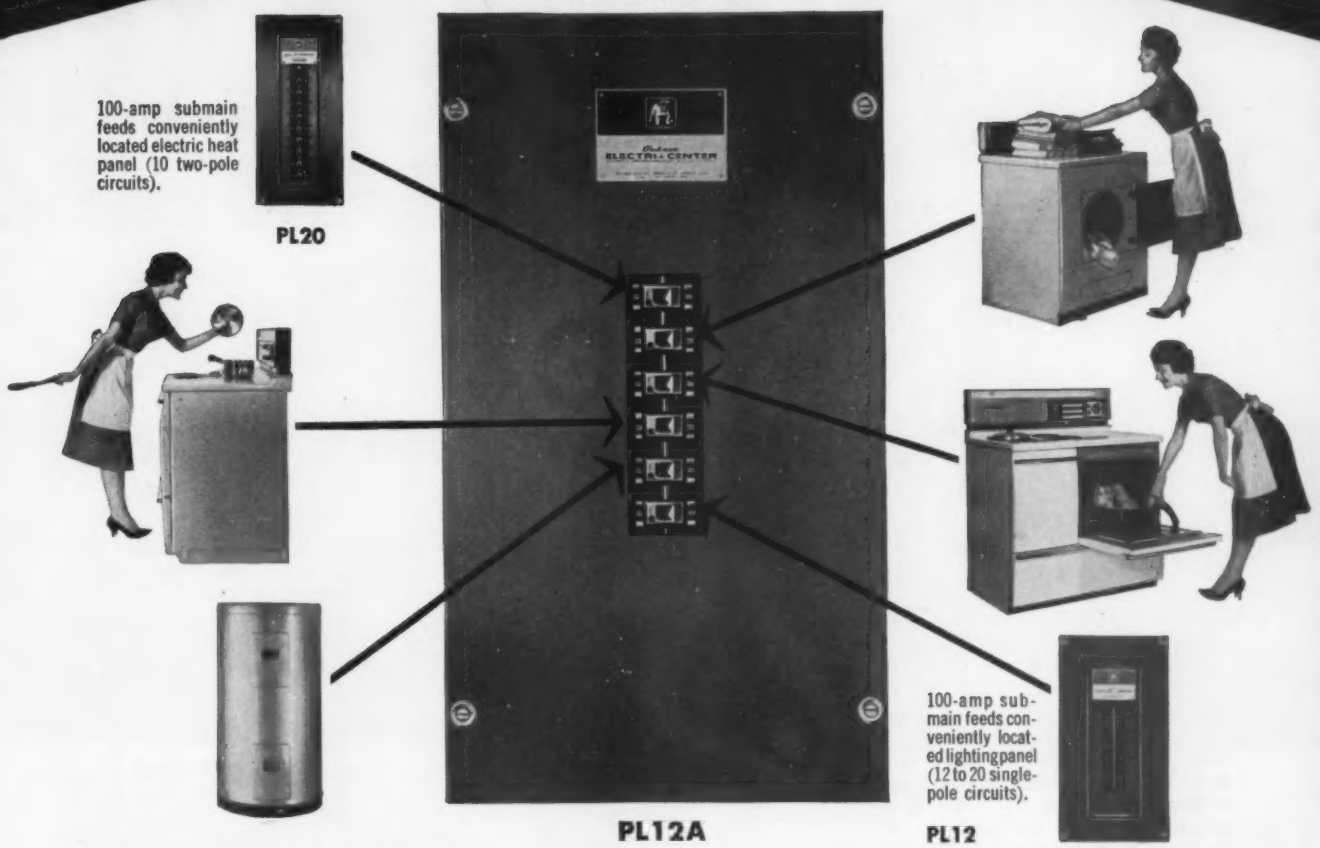
This symbol stands for circuit breaker

This symbol stands for QUALITY

BULLDOG'S 200-AMP SERVICE DISTRIBUTION PANEL—

"Power-packed" for all-electric homes!

Here's Electri-Center circuit flexibility aplenty for heating, lighting, appliances...


100-amp submain feeds conveniently located electric heat panel (10 two-pole circuits).
PL20
PL12A
100-amp submain feeds conveniently located lighting panel (12 to 20 single-pole circuits).
PL12

Originated by BullDog expressly for service distribution in all-electric homes, the Pushmatic® 200-amp PL12A Electri-Center® provides any combination of circuits up to 24 poles . . . and allows location of subpanels for customer convenience—and *wiring convenience!* Other 100- and 200-amp Electri-Center panels provide a wide choice that meets all other residential requirements.

Pushmatic circuit breakers protect two ways! In Pushmatic breakers from 15 to 50 amps, a built-in time-delay prevents nuisance tripping from harmless, normal current inrush, but assures positive protection against dangerous overloads. In every Pushmatic, a magnetic coil trips immediately, *without* delay, if a short circuit occurs. By combining these two safety systems, Pushmatic breakers assure dependable protection under all residential load conditions.

For details write for your "Pushmatic Pocket Guide"—it's free!

BullDog Electric Products Division, I-T-E Circuit Breaker Company, Box 177, Detroit 32, Mich. In Canada: 80 Clayson Rd., Toronto, Ont. Export Division: 13 East 40th St., New York 16, N.Y.

Contact the I-T-E Office in your locality for additional product information and service.

I-T-E CIRCUIT BREAKER COMPANY

BULLDOG ELECTRIC PRODUCTS DIVISION

tubes—a set of white, one of green, and the third in blue.

Three switches control the lights, one switch for each color.

"We utilize the varied lighting effects to reproduce the color scheme of a prospect's kitchen," explained K. C. Shepherd, a member of the firm. "If her kitchen is predominantly blue, we switch on the blue lights and the appliances show up in a subdued blue effect, to show how they will stand out against her blue kitchen background."

If neither of three basic colors is effective, then by use of the switches any two combinations may be used, or all three sets of lights may be turned on to create still another effect. Blue and white create a different color scheme from any of the three basic colors, as do blue and green or white and green.

It is possible to re-create practically any color scheme by manipulation of the three switches, Mr. Shepherd declared.

"And the use of the lighting system has turned more than one, 'I'd better wait and think about my kitchen colors before buying' into an 'I'll take it now' customer. The lighting combinations remove one logical excuse for putting off buying a particular appliance."

Behind 28 translucent plastic ceiling panels, each four feet square, are three different sets of 48-inch tubes, in white, green, and blue.

New utility body carries extensive amount of equipment

◆ A new utility body jobplanned for electrical contracting services has been placed in use by Knight Electric, of 4590 Park Street N., St. Petersburg, Fla.

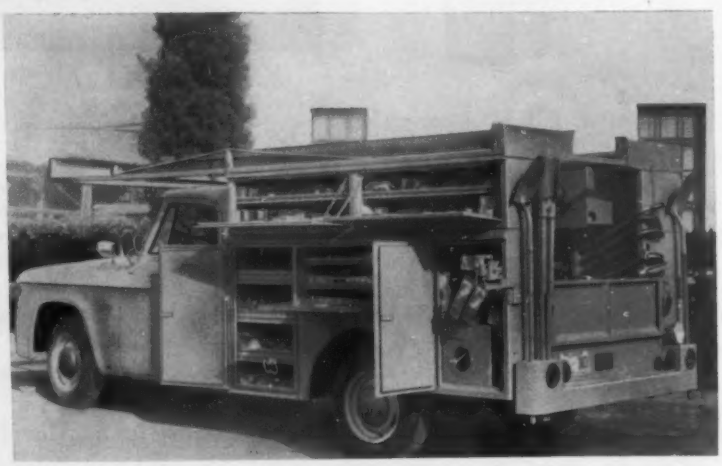
Merton J. Knight reports that the new body has improved and increased his business and effected substantial time savings by making it possible to carry more material to job locations and providing "a place for everything where it's easy to get to." Mr. Knight also rates high the fact that the exterior compartments are waterproof and can be securely locked.

The body, manufactured by the Reading Body Works, Inc., of Reading, Pa., is mounted on a ¾-ton Dodge chassis, and serves as a highly efficient mobile workshop for service technicians.

Six weather tight outside compartments with removable shelves and adjustable bin dividers permit "file-box" storage of tools and small parts. Generous inside storage space accommodates larger objects.

All compartment doors are die-formed twin panels, hung on free-acting hinges. Unitized welded steel construction is reinforced at all critical stress points, and the body is completely undercoated to protect against rust, etc.

To further adapt the body to the particular requirements of Knight Electric, it was equipped with extra shelves in the outside compartments, hooks for coiled wire, pockets for pipe wrenches, a ladder rack, pipe racks, pipe bender racks, pipe vise racks, and a water cooler.



The exterior compartments of the unit are waterproof and can be locked. Men using the truck can easily locate materials because of its design.

CIRTUBE EMT is the one on top

Shown here unplated

The other one is ordinary EMT that failed early in a pressure test. CIRTUBE EMT held up far beyond UL requirements. The reason: *continuous induction welding*, by far the best technique for making *bead-free, split-free* welds on high quality EMT.

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Application of Code requirements

Electrical control equipment used in Class II, Division I locations must be protected with approved dust-ignition-proof enclosures

By Walter R. Stone, Contributing Editor on Code Rules, Utica, N. Y.

◆ When used in conjunction with control equipment with motors, generators, or appliances in Class II, Division 1 locations, control transformers, solenoids, impedance coils, and resistors, together with any associated switching mechanisms or overcurrent devices, are required by Paragraph (a) of Section 502-7 to be provided with dust-ignition-proof enclosures approved for Class II locations.

Control transformers, impedance coils, and resistors are not permitted to be installed in locations where there exist, or where there may exist, dusts from mag-

---

Code test questions

1. Where installed in Class II, Division 2 locations, but where not located in the same enclosure with switching mechanisms, control transformers and impedance coils associated with rotating electrical machinery need not be provided with dust-ignition-proof enclosures approved for Class II locations. True or false?

2. Adjustable type resistors which are associated with rotating electrical machinery and which are installed in Class II, Division 2 locations are not required to be provided with dust-ignition-proof enclosures unless they form a part of an automatically timed starting sequence device. True or false?

3. A motor approved for Class II locations may be installed in a Class II, Division 1 location containing grain dusts whether it is a totally enclosed not ventilated, totally enclosed pipe ventilated, or totally enclosed fan cooled motor. True or false?

4. In Class II, Division 2 locations a standard open type motor without sliding contacts, switching mechanisms, or overcurrent devices may be installed where, in the judgment of the Code enforcement authority, only moderate accumulations of non-conducting, non-abrasive dusts are likely to occur. True or false?

5. Electrically-heated appliances installed in Class II, Division 2 locations need not be of the dust-ignition-proof type approved for Class II locations provided that they are enclosed in tight-fitting metal housings with telescoping covers designed to minimize the entrance of dusts and are without openings through which arcs, sparks, or hot particles could ignite dust or adjacent combustible materials. True or false?

6. Motors of motor-driven appliances in Class II, Division 2 locations:

(a) need not conform to the requirements of other types of motors and other rotating electrical machinery installed in Class II, Division 2 locations.

(b) shall conform to the requirements for other types of motors and other rotating electrical machinery installed in Class II, Division 2 locations.

(c) are required to conform to a different set of rules entirely from those governing other types of motors and other rotating electrical machinery installed in Class II, Division 2 locations.

Which is correct? a? b? or c?

7. Fixed lighting fixtures installed in Class II, Division 1 locations:

(a) shall be only of the dust-ignition-proof type approved for Class II locations.

(b) when not of a type approved for Class II locations, shall be designed to minimize the entrance of dust and to prevent the escape of sparks, burning material, and hot metal.

(c) shall be only of the explosion-proof type.

Which is correct a? b? or c?

8. Fixed lighting fixtures installed in Class I, Division 2 locations:

(a) shall be only of the dust-ignition-proof type approved for Class II locations.

(b) when not of the type approved for Class II locations, shall be designed to minimize the entrance of dust and to prevent the escape of sparks, burning material, or hot metal.

(c) shall be only of the explosion-proof type.

Which is correct? a? b? or c?

9. Portable lighting fixtures installed in Class II, Division 2 locations:

(a) shall be only of the dust-ignition-proof type approved for Class II locations.

(b) when not of a type approved for Class II locations, shall be designed to minimize the entrance of dust and to prevent the escape of sparks, burning material, or hot metal.

(c) shall be only of the explosion-proof type.

Which is correct? a? b? or c?

10. Flexible cords:

(a) shall not be used in Class II locations.

(b) when used in Class II locations shall be of the type approved for extra hard usage.

(c) shall not be used in Class II, Division 1, but may be used in Class II, Division 2 if of the type approved for hard usage.

Which is correct? a? b? or c?

Correct answers will be found at end of article on page 90.

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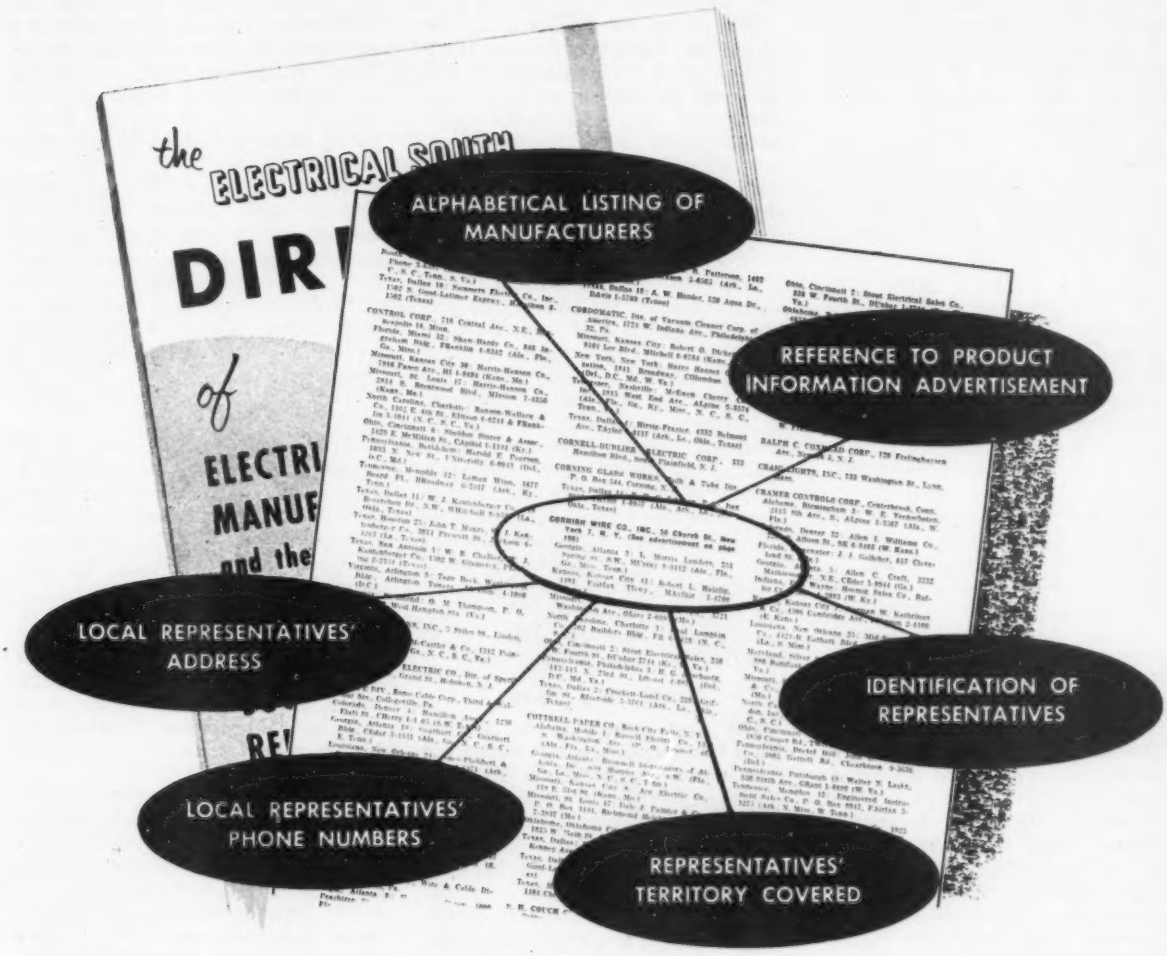

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nesium, aluminum, aluminum-bronze powders, or from other metals of similarly hazardous characteristics unless provided with enclosures specifically approved for such locations.

Paragraph (b) of Section 502-7 separates the equipment described in Paragraph (a) above into three categories for Class II, Division 2 locations with separate requirements for each as follows:

(1) Switching mechanisms and overcurrent devices associated with control transformers, solenoids, impedance coils, and resistors and which are not installed where dusts are electrically conductive, are required to be provided with tight metal enclosures designed to minimize the entrance of dusts and which are equipped with close-fitting covers or telescoping covers and which have no openings for the escape of arcs, sparks, or hot particles or through which dust or adjacent combustible material could be ignited.

Holes for mounting screws are required to be outside of such enclosures, affixed as appendages.

(2) Control transformers, solenoids, and impedance coils, when not within the same enclosure as the switching devices, are required to be provided with tight-fitting metal enclosures without ventilating or other openings.

(3) Resistors and resistance devices are required to be provided with dust-ignition-proof enclosures approved for Class II locations. However, there are two exceptions: (a) non-adjustable resistors and (b) resistors which are a part of automatic time-sequence starting devices may have only tight-fitting metal enclosures without ventilating or other openings provided that the operating temperature of such resistors will not exceed 120 C.

Rotating electrical machinery, such as motors and generators, is required by Paragraph (a) of Section 502-8 to be approved for Class II locations and be of the following types when installed in Class II, Division 1 locations: totally enclosed, not ventilated; totally enclosed, pipe ventilated; or totally enclosed, fan cooled.

When installed in areas where there is, or where there may be, dust from magnesium, aluminum, aluminum-bronze powders, or similarly hazardous metals, such machinery is further required to be specifically approved for such locations and be totally enclosed or totally enclosed fan cooled.

Paragraph (b) of Section 502-8 has the same requirements for rotating electrical machinery which is installed in Class II, Division 2 locations as the requirements listed in Paragraph (a) above for Class II, Division 1, except as follows:

Where, in the judgment of the inspection authority having jurisdiction, dust accumulations are so moderate in amount as to be non-hazardous; the type of dust present, or likely to be present, is non-conductive and non-abrasive; and where the machinery and its equipment is readily accessible for routine cleaning and maintenance, then the following types of rotating electrical machinery are also permitted: self-cleaning textile motors of the squirrel-cage type; standard open type machines without sliding contacts, switching mechanisms, overcurrent devices, or integral resistance devices; or standard open type machines which do have such contacts, switching mechanisms, or resistance devices which are enclosed within tight metal housings without ventilating or other openings.

Rotating electrical machinery of the partially enclosed or splash-proof type is not permitted to be installed in Class II locations.

Ventilating pipes

The first paragraph of Section 502-9 has certain requirements for ventilating pipes when installed in either Division 1 or Division 2 of Class II locations with additional requirements listed in Paragraphs (a) and (b) for Divisions 1 and 2 respectively. The requirements which are stipulated for both divisions are as follows: (All rules apply whether ventilating piping is installed for rotating electrical machinery or for enclosures for other electrical equipment.)

Piping is required to be of metal not lighter than 24 USS gauge or of other non-combustible material of equal strength; to lead to a source of clean air outside of the building; to be screened at the outer end to prevent the entrance of bats, birds, or bugs; and to be protected against physical damage and against rust and other corrosive influences.

Paragraph (a) further requires for Division 1 locations that ventilating piping, together with connections to rotating electrical machinery or to dust-ignition-proof enclosures, be dust-tight throughout its length; and, for metal piping, that joints and seams be riveted and soldered, bolted and soldered, welded, or rendered dust-tight by other equally effective means.

Paragraph (b) requires for Division 2 locations that ventilating piping, together with connections to machinery and enclosures, be sufficiently tight to minimize the entrance of dust into the ventilated equipment and enclosures and to prevent the escape of arcs, sparks, or hot particles which could ignite dust or adjacent combustible material.

Metal piping in Division 2 may utilize lock seams along the length of the piping and riveted or welded joints where two lengths are joined together. Tight-fitting slip joints are permitted in ventilating piping where flexibility is necessary in Division 2 locations.

Appliances

Paragraph (a) of Section 502-10 requires all appliances in Class II, Division 1 locations, whether fixed or portable, electrically-heated, motor-driven, or any other type, to be dust-ignition-proof and approved for Class II locations.

Such appliances are required to be specifically approved for the location if installed or used in areas where there are, or where there may be, dusts from magnesium, aluminum, aluminum-bronze powders, or other similarly hazardous metals.

Paragraph (b) requires appliances and associated equipment to comply with the following requirements when used or installed in Class II, Division 2 locations:

(1) Electrically-heated appliances are required to be dust-ignition-proof and approved for Class II locations.

(2) Motors of motor-driven appliances are required to be totally enclosed not ventilated, totally enclosed pipe ventilated, or totally enclosed fan cooled except:

Where, in the opinion of the Code enforcement authority, dust accumulations will be so moderate as to be non-hazardous; where only non-conductive, non-abrasive dusts are likely to be present; and where such motors will be readily accessible for routine cleaning and maintenance, then standard open type motors without sliding contacts, switching mechanisms, overcurrent devices, or integral resistance devices, or open type motors which do have such contacts, switching mechanisms, or resistance devices which are provided with tight metal enclosures may be used or installed.

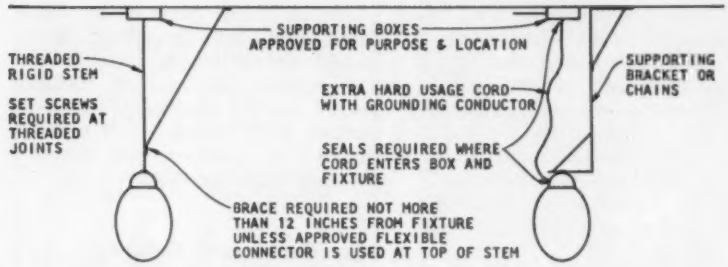

Fig. 1—Ceiling and pendent fixtures in Class II, Division 1 locations are required to be of the dust-ignition-proof type and approved for Class II locations. These fixtures are required to be protected from physical damage by their location or by guards.

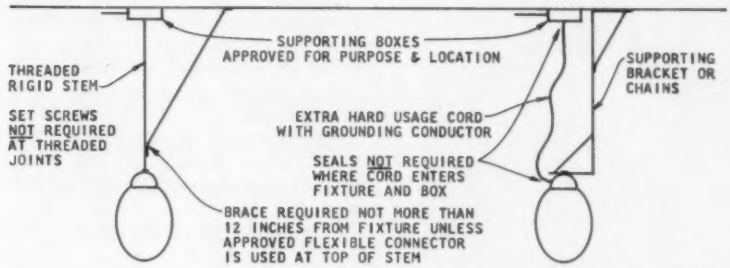

Fig. 2—Ceiling and pendent fixtures in Class II, Division 2 locations are *not* required to be of the dust-ignition-proof type; but, if not, must be designed to minimize entrance of dust and to prevent escape of arcs or hot metals, and must be marked with maximum wattage which can be used without exceeding a surface temperature of 165 C. Fixtures are required to be protected by location or by guards.

(3) Enclosures for switches, circuit breakers, and fuses are required to be provided with tight metal enclosures designed to minimize the entrance of dusts, which are provided with tight-fitting or telescoping covers, and which are without openings through which arcs, sparks, or hot particles could escape and ignite dust or adjacent combustible material. Mounting holes are required to be affixed to the exterior of such enclosures.

(4) Transformers, solenoids, and impedance coils are required to be provided with tight metal enclosures without ventilating or other openings.

Resistors and resistance devices are required to be provided with dust-ignition-proof enclosures approved for Class II locations except for non-adjustable resistors and resistors which are a part of automatic time-sequence starting devices, in which case they may be provided with tight metal housings without ventilating or other openings provided that the operating temperature of such resistance devices does not exceed 120 C.

A fine print note following Section 502-10 stipulates that where there is a possibility of portable appliances being used in both Division 1 and 2 locations, they should conform to the minimum requirements for Division 1.

Lighting fixtures

Lighting fixtures which are installed in Class II locations are governed by the provisions of Section 502-11. Paragraph (a) of this section requires all fixtures in Division 1 locations to be of the dust-ignition-proof type approved for Class II locations and clearly marked to indicate the maximum lamp wattage for which they are approved.

In areas where dust from magnesium, aluminum, aluminum-bronze powders, and from other metals of similarly hazardous characteristics is or may be present, all lighting fixtures, whether fixed or portable, together with all associated auxiliary equipment, are required to be specifically approved for such locations.

All lighting fixtures are required to be protected from physical damage either by location or by suitable guards. Pendent fixtures are required to be suspended by means of threaded rigid conduit stems, chains with approved fittings, or other approved means.

"Other approved means" would include locally approved hangers, such as flat iron or angle iron brackets securely suspended from the ceiling for the physical support of fixtures.

Pendent fixtures

Pendent fixtures which have rigid stems longer than 12 inches in length are required to be provided with permanent and effective braces against lateral movement not more than 12 inches from the lower end of such stems; or the stems are required to be made flexible by means of flexible connectors approved for the purpose and for the location.

The flexible connectors, where used, are required to be installed not more than 12 inches from the point of attachment of the stems to the ceiling or to the supporting boxes or fittings. Threaded joints in conduit stems are required to be provided with set screws to prevent inadvertent loosening of the joints.

Pendent fixtures which are not wired in rigid conduit are required to be connected by means of flexible cord approved for extra hard usage. Paragraph (a) (3) of Section 502-11 states that such cord is to be approved for "hard usage." However, Section 502-12 states that flexible cord used in Class II, Divisions 1 and 2 "shall be of a type approved for extra hard usage."

Therefore, flexible cord approved only for hard usage would not be acceptable for use in any Class II location by the provisions of Section 502-12 despite the misnomer in Section 502-11 (a) (3).

Types S, SO, and ST are listed in Table 400-11 as suitable for extra hard usage. Types P, PW, K, SJ, SJO, and SJT are listed as suitable for hard usage.

When pendent fixtures are connected by means of flexible cord, suitable seals are required to be provided where the cords enter such fixtures and where they enter the outlet boxes on fittings. Flexible cord is not permitted to support the weight of the fixtures. See Figure 1.

Boxes, box assemblies, or fittings which are used for the support of lighting fixtures are required to be approved for the purpose and for Class II locations.

Paragraph (b) of Section 502-11 governs the installation of lighting fixtures in Division 2 of Class II locations. Portable lighting fixtures are required to be dust-ignition-proof and approved for Class II locations. Such fixtures must be marked to show the maximum wattage of the lamps for which they are approved.

Fixed lighting, where not approved for Class II locations, is required to be provided with enclosures designed to minimize the entrance of dust and to prevent the escape of arcs, sparks, or hot particles.

Fixtures are required to be marked with the maximum lamp wattage which may be used without causing a surface temperature on the fixture in excess of 165 C.

Fixed lighting fixtures are required to be protected from physical damage either by location or by means of suitable guards. Pendent fixtures have the same requirements for bracing or for the use of approved flexible connectors in Division 2 as in Division 1.

However, in Division 2 threaded stems are not required to have set screws, and flexible cords are not required to have seals where entering the fixtures and the supporting boxes or fittings.

As in Division 1, cords in Division 2 are required to be approved for extra hard usage, and they are not permitted to be used for the support of the fixtures. (Section 502-11 (b) (4) has the same misnomer about hard usage cord as that mentioned above for Division 1.) See Figure 2.

As in Division 1, boxes, box assemblies, and fittings used for the support of fixtures in Division 2 are required to be approved for the purpose and for the location.

Control equipment

In Class II, Division 2 locations, starting and control equipment for electric discharge lamps is required to comply with the following requirements:

(1) Switching mechanisms are required to be provided with tight metal enclosures designed to minimize the entrance of dust and equipped with tight-fitting or telescoping covers and to be without openings through which arcs, sparks, or hot particles could escape and ignite dust or adjacent combustible materials. Mounting holes are required to be outside of the box in appendages.

(2) Coils and windings, when not in the same enclosure with switching mechanisms, are required to be provided with tight metal housings without ventilating or other openings.

(3) Resistors and resistance devices are required to be dust-ignition-proof and approved for Class II locations except for non-adjustable resistors or resistors which are a part of automatic time-sequence starting devices, in which case tight metal housings without ventilating or other openings may be used, provided that the maximum operating temperature does not exceed 120 C.

Section 502-12 requires that flexible cords which are used in Class II, Divisions 1 and 2 be approved for extra hard usage, be

(Continued on page 90)

Questions on the Code

(Readers are invited to send in questions which they would like to see discussed in this department.)

Can metal foil insulation affect insulated boxes?

QUESTION: Will you please send us information on insulated outlet boxes.

We are particularly interested in an interpretation of the Code requirements for the use of insulated boxes in residences with metal foil insulation, whether they are considered sufficient insulation or whether the fixtures are required to be grounded, etc.

ANSWER: There would be no Code violation for the metal foil to be in contact with approved non-metallic boxes. Of course, the foil should be cut back or set back when the boxes are installed in such a way that the metal foil would not come in contact with any metal fixtures which would be installed on the boxes.

But the insulated boxes themselves would not conduct current from the foil to the fixtures, nor from a fault in the box or fixtures to the foil.

It is metallic boxes which are required by Section 370-4 to be grounded or insulated from such metallic substances as metal lath or metal foil insulation.

If metallic boxes were not insulated from such conductive substances, a fault to the metal box would energize the foil throughout the house unless the box itself was grounded with impedance sufficiently low to assure immediate operation of the overcurrent device.

An electrical fault in an insulated box, on the other hand, would not affect the metal foil.

I repeat, any metal fixtures should not be allowed to come in contact with the foil lest a fault in such fixtures energize the foil through such contact.

May fluorescent fixtures be connected with cords?

QUESTION: Are fluorescent fixtures allowed to be connected by cords? Or must they be connected by a metallic wiring method?

ANSWER: Section 410-14 states, "In general, fluorescent fixtures when supported independently of the outlet box shall be connected through metal raceways or armored conductors.

"This requirement may be waived when cord equipped fixtures are suspended directly below the outlet box and the exposed cord is not subject to strain or physical damage."

One of the provisions of this section which specifies that the fixture be suspended directly below the outlet box if a cord is to be permitted was intended primarily to restrict the length of the cord and to prevent extending it along the ceiling and then dropping down to the fixture.

However, as worded, this provision has brought into question whether an approved cord-equipped fixture could be suspended from a wall or mounted in a cove or in a cornice and plugged into a receptacle outlet close to, but not necessarily directly above, the fixture.

There is seldom a real need to use cord-equipped fixtures except where suspended from ceilings by chains. For this reason, many inspectors are known to prefer that cord-equipped fixtures be restricted to this use.

At the same time, however, they are reluctant to reject other type installations provided that the cord is exposed and as short as possible, but protected from strain and physical damage, provided that only approved cord-equipped fixtures are used, and provided that, where grounding is needed, only grounding type cords and grounding type receptacle outlets are used.

Sometimes in hard-to-reach places such cord-equipped fixtures are preferred because they are more easily maintained and replaced. Most inspectors accept them under such conditions.

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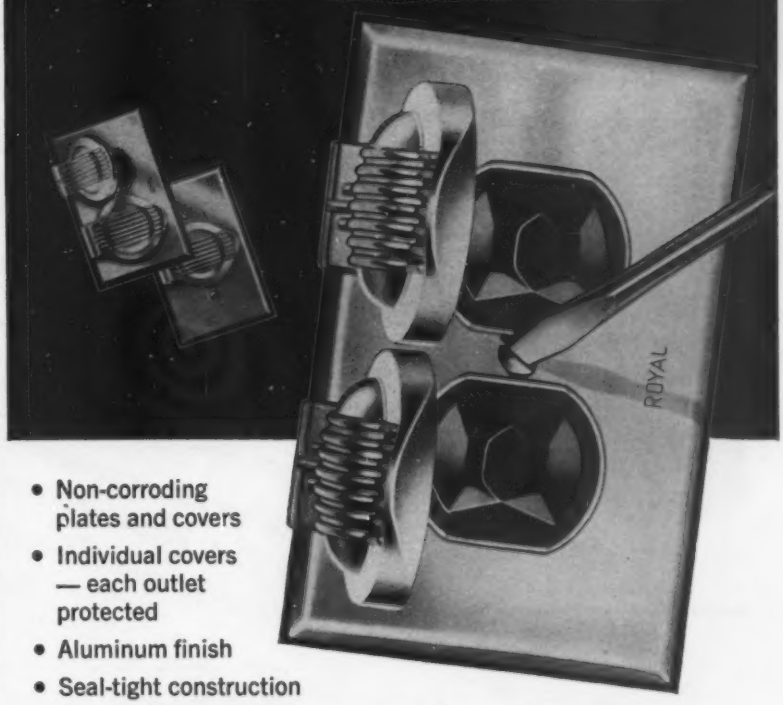

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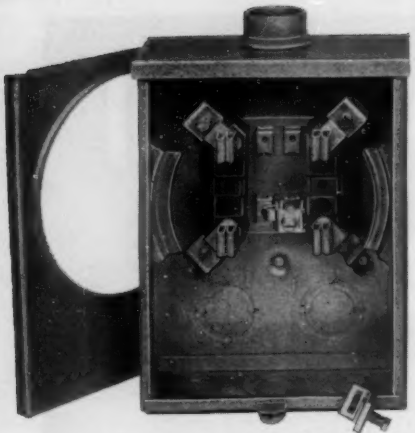

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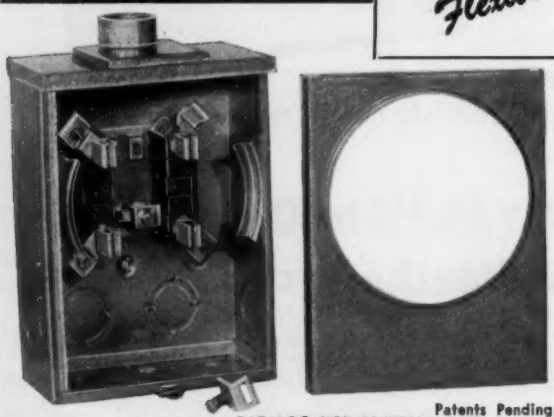

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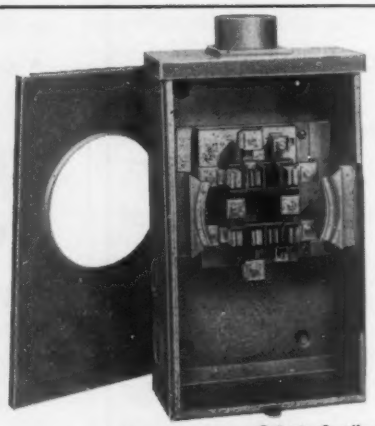

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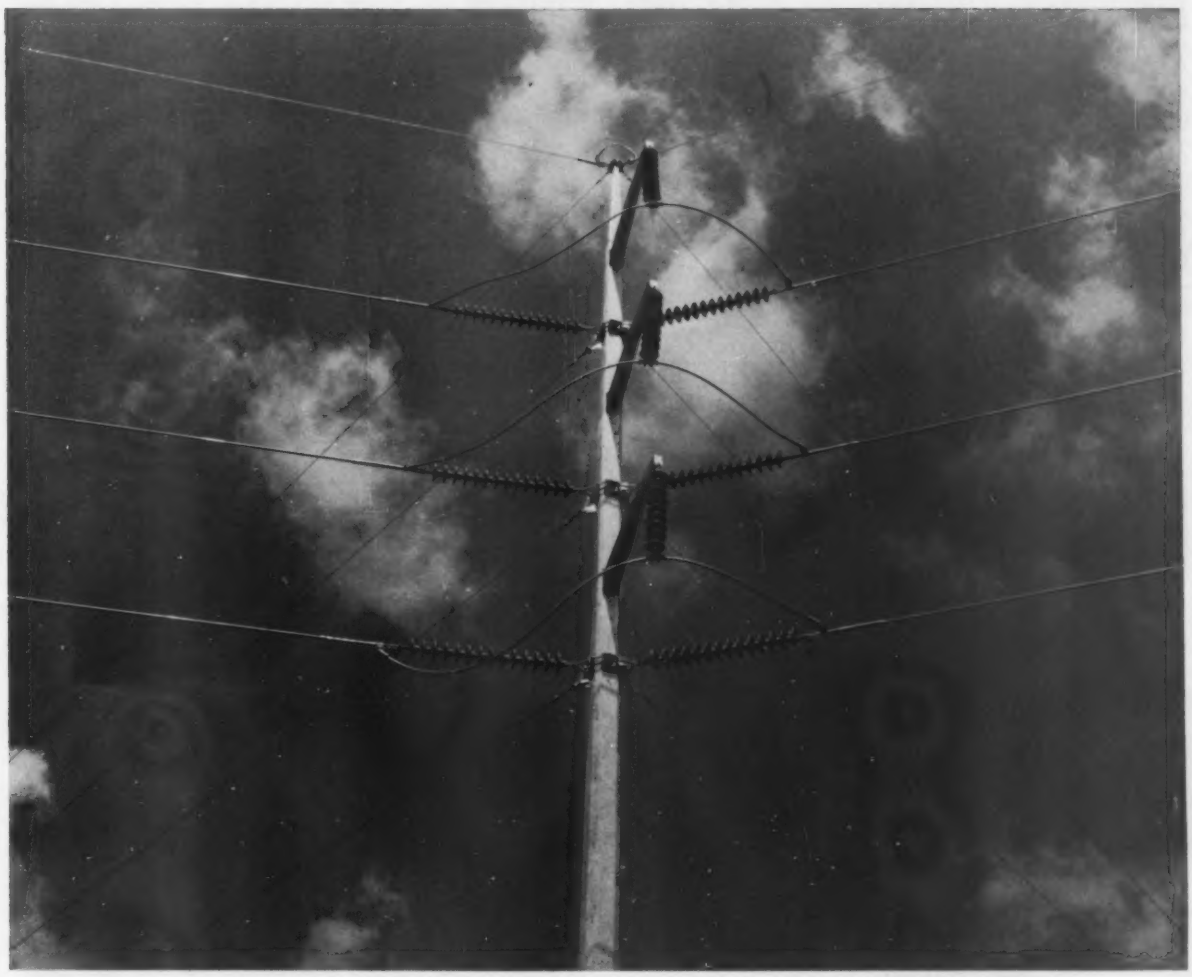

This is one of the structures on Louisiana Power & Light Company's new 115-kv line—page 56

New impact wrench makes hole drilling easier—page 48

Relay protection for a 24-kv distribution system—page 50

System voltage regulation analysis—page 54

Application and operation of voltage regulators—page 60

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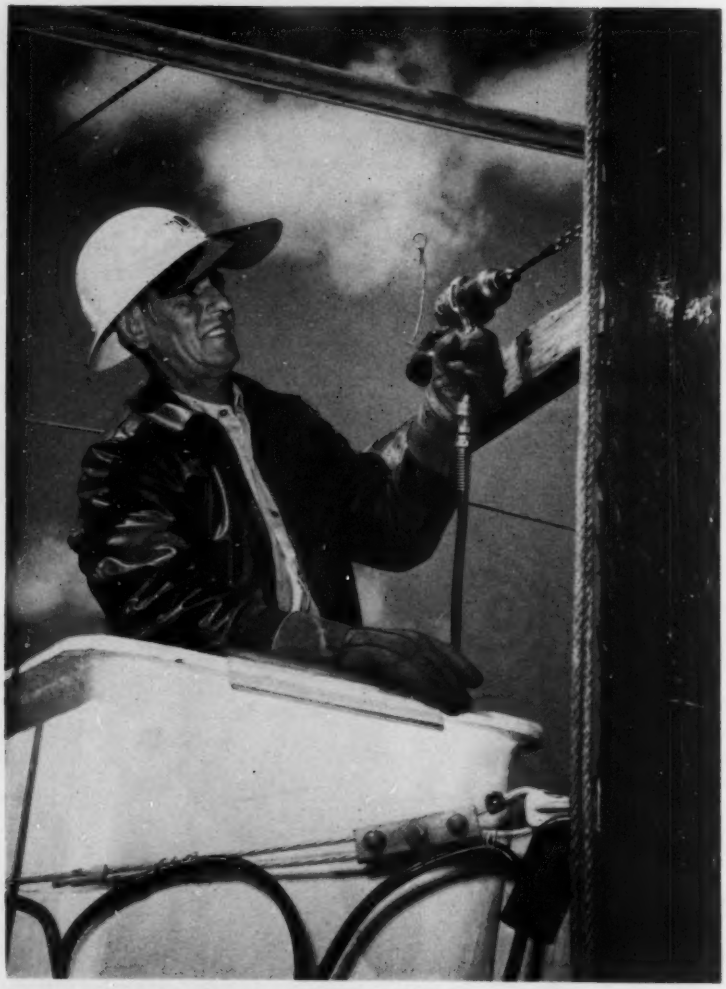
New impact

A lineman needs



With the new device even a right-handed lineman finds it easy to drill holes with his left hand. This man is using a pneumatic impact wrench.

By C. Clyde Crockett, Transportation Superintendent, Louisiana Power & Light Co., New Orleans, La.

◆ In a never-ending quest to find ways of making the job easier through mechanization, Louisiana Power & Light Company in New Orleans, La., with the cooperation of Snap-on Tools Corporation of Kenosha, Wis., has made one of the lineman's most difficult jobs simple and easy—that of drilling holes in wood poles, timbers, and crossarms.

This has been done by adding a ½-inch square-drive socket head to a ship auger wood bit and driving this bit with an ordinary ½-inch square-drive wrench, both electric and pneumatic.

Development of this technique and the necessary bit began in the middle of 1958 when it was found that an impact wrench could do an excellent job of driving wood bits in drilling holes. The first trial was made with an 11/16-inch

Right angle drilling is easy with this electric model.

Here the lineman is shown drilling with his left hand.

wrench makes hole drilling easier

to have only one tool with him to do both drilling and wrench work

ship auger bit from which the tapered shank had been removed. This was fitted into a Jacobs chuck adapted for fitting onto the ½-inch square-drive head of the impact wrench.

Drilling results were excellent, but many problems arose and each had to be solved before the technique itself could be called a success.

First, it was found that the impact action on the Jacobs chuck would tighten the chuck so tight that the ordinary chuck wrench could not loosen it for removal of the bit.

A longer handle for greater leverage was tried; but in the end had to be abandoned because, after considerable drilling, the chuck was so tight that the teeth of the wrench and the teeth of the chuck both became damaged when trying to remove the bit with the longer handled wrench.

In addition to this problem, an excessive amount of "sloppiness" was present in the bit because of the sloppy fit of the square-drive head in the square socket. Another problem of major concern was the fact that the shank of the bit would occasionally snap in two when hard drilling was encountered.

The added weight of the heavy duty Jacobs chuck at the end of the impact wrench also made a very badly balanced tool of the assembly.

At this point, toward the end of 1958, the conclusion was reached that a manufacturer must develop a ship auger bit with an oversize shank to withstand the shocks of the impact wrench, and with a ½-inch square-drive socket head attached in perfect alignment to the end of this oversize shank which would have a closer fit to eliminate excessive "sloppiness."

Snap-on Tools Corp., after being thoroughly informed of the developments to that time, including the many advantages to be derived, undertook to make the bit. As with all new developments, many unforeseen difficulties were encountered and had to be solved with consequent delays in final delivery.

These special bits, which were only a part of an over-all project of providing powered hand tools on all line construction trucks, all basket trucks, and all substation construction trucks, were finally received and distributed to all crews in January, 1961.

Tools for the project had been received in August, 1960, and the five-month delay in receiving the special bits was quite disconcerting. However, our sincere thanks go to Snap-on Tools Corporation and its representatives for finally developing a bit that fits all the requirements specified.

We have found, as we expected to find, that drilling with impact wrenches gives us the following advantages:

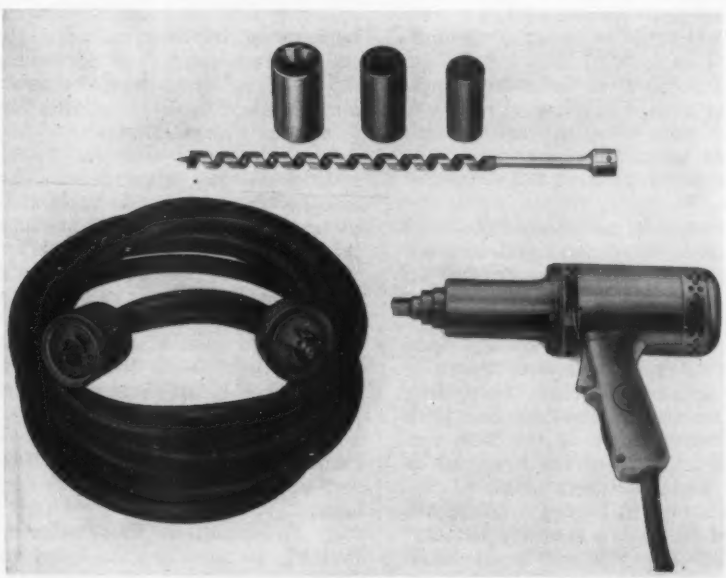
(1) A lineman or mechanic need have only one tool with him to do both drilling and wrench work.

(2) The electric impact wrench is much lighter than an electric drill (7-3/4 pounds versus 12 pounds) and much better balanced and, therefore, more easily handled. (The pneumatic drill is the lightest of all the hand tools, weighing only 3-3/4 pounds versus the air impact wrench's six pounds, but does not possess all the desirable characteristics of the impact wrench.)

(3) The impact wrench when used for drilling exerts no appreciable torque (as does an electric drill) which must be overcome by the operator.

(4) There is a b s o l u t e l y no clogging of the bit when drilling with an impact wrench such as is the case with an electric drill. The impact action breaks up the wood shavings, allowing them to be fed out of the hole continuously, even on newly creosoted pine poles.

(Continued on page 91)



This is the equipment furnished linemen for drilling and wrench work.

Relay protection for a 24-kv distribution system

Scheme gives adequate protection in Greensboro

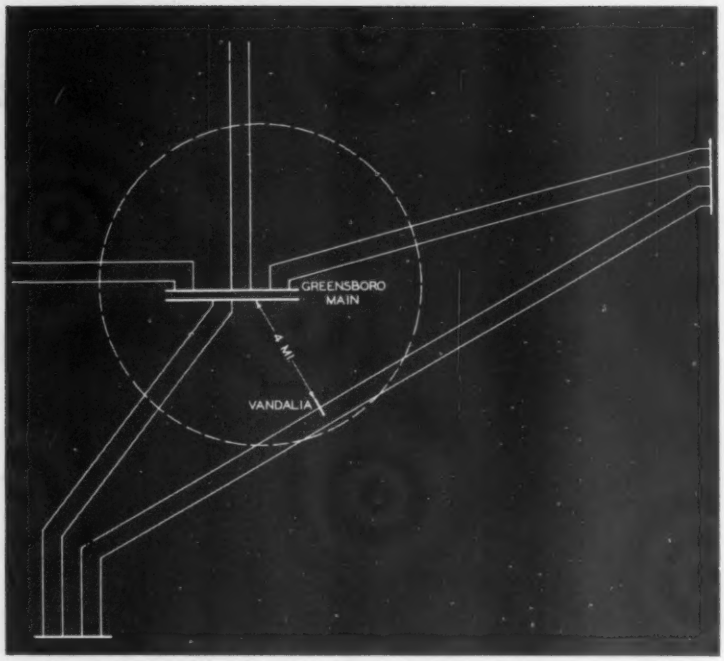


Fig. 1—Here are the 24-kv distribution substations in Greensboro.

By W. N. Taylor, System Relay Engineer, Duke Power Co., Charlotte, N. C.

◆ What we consider to be adequate relay protection for a 24-kv, four-wire distribution system can be found at Greensboro, N. C., a city of 125,000 people and covering an area of 50 square miles.

Greensboro is served by two 100/24-kv substations, Greensboro Main, with a peak transformer capacity of 133 mva, and Vandalia, with a peak transformer capacity of 21.6 mva, shown in Figure 1. In addition to the 100/24-kv delivery there is a 100/4.16-kv delivery with transformer capacity rated 18 mva.

This article will discuss primarily the Greensboro Main Substation and its associated 24-kv lines, as the Vandalia Substation consists of only one transformer bank and four radial lines. Its relaying is similar to that at the Greensboro Main Substation.

At Greensboro Main Substation (Figure 2) the load is supplied from four separate 24-kv busses. This keeps fault duties at a minimum and provides an alternate supply in case of loss of voltage to any bus section. The 24-kv lines are radial and supply step-down substations to industrial, commercial, and residential loads.

Some single-phase, line-to-neutral load is supplied from the 24-kv system, but most of the substations are three-phase. Typical connections of the substation transformers are as follows:

(1) Wye-Wye, both neutrals grounded, 24 kv to 12.47 kv,

(2) Wye-Wye, both neutrals grounded, 24 kv to 4.16 kv,

(3) Wye-Delta, neutral ungrounded, 24 kv to 240 volts,

(4) Wye-Delta, neutral ungrounded, 24 kv to 480 volts,

(5) Wye-Delta, neutral ungrounded, 24 kv to 2.4 kv,

(6) Delta-Wye, neutral grounded, 24 kv to 12.47 kv,

(7) Delta-Wye, neutral grounded, 24 kv to 4.16 kv,

(8) Delta-Wye, neutral grounded, 24 kv to 208 volts, and

(9) Delta-Delta, 24 kv to 240 volts.

Fuses, air break switches, oil circuit breakers, and reclosers are used as sectionalizing devices on the 24-kv branch lines and on the 24-kv substations.

Some load stations are equipped with automatic swapover from one line to another. Each 24-kv line can be tied to another line with disconnects. Two of the lines can be tied to two of the lines out of the Vandalia Substation.

As shown in Figure 2, banks No. 5 and No. 8 are supplied through one 100-kv OCB and banks No. 6 and No. 7 are supplied through another 100-kv OCB. Each bank is controlled by a motor-operated, 100-kv HT gang switch and a pneumatic operated 24-kv LT OCB.

100-kv breakers

Each of the two 100-kv breakers is equipped with overcurrent induction disc relays, both phase and ground. The phase induction relays are equipped with instantaneous attachments which trip through induction cylinder type relays. The cylinder relay is used to control tripping of the instantaneous attachments because it is not sensitive to d-c offset which occurs in magnetizing inrush currents to power transformers.

This makes possible a lower setting on the attachments. The cylinder relay cannot be connected to trip directly, as it might close its contacts because of shock or vibration. All these relays operate a hand-reset auxiliary relay which trips the 100-kv OCB's, both 24-kv bank OCB's on the banks supplied through the 100-kv OCB, and the tie breaker between bus sections No. 6 and No. 7.

This hand-relay also blocks reclosing of the 100-kv breaker. The reclose function will be described later.

A two-position "bus selector switch" is installed to provide proper protection for normal operation of the 100-kv busses — as

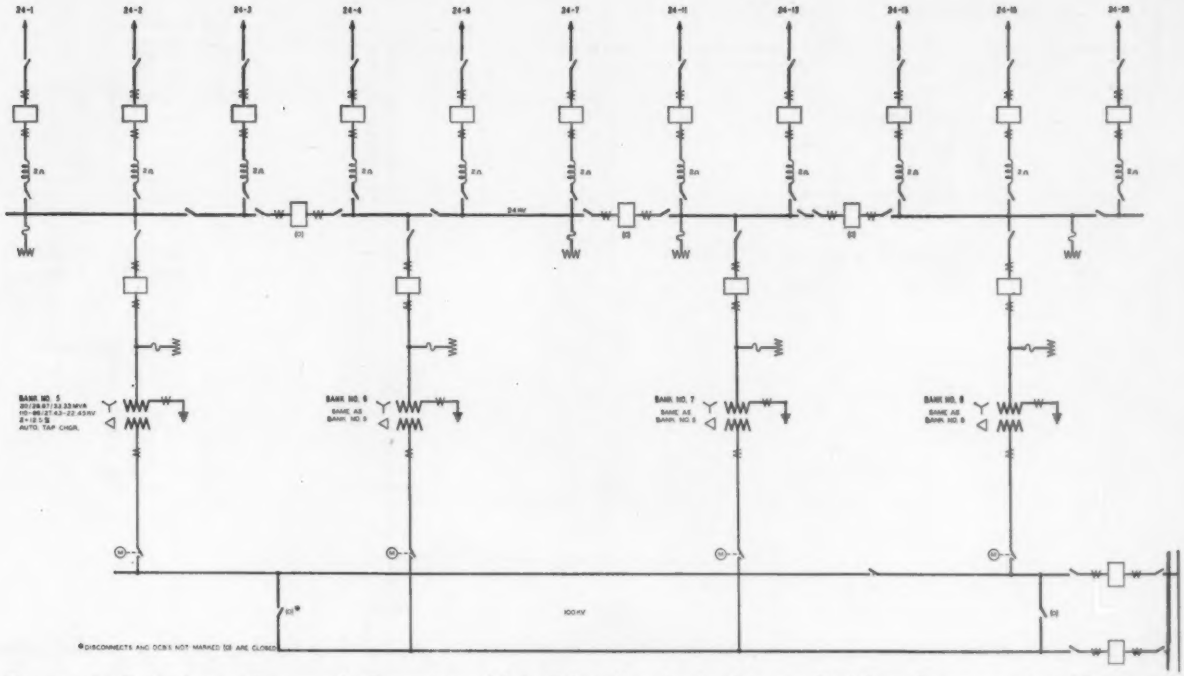


Fig. 2—At Duke Power Company's Greensboro Main Substation the load is supplied from four separate 24-kv busses.

shown in Figure 2—or to allow either 100-kv breaker to carry all the load.

This switch is marked "split" and "solid." In the "solid" position, all relays that trip either 100-kv breaker trip both 100-kv breakers. In the "split" position, the relays trip their respective 100-kv breaker.

100/24-kv banks

An alarm panel is installed in the substation yard. This panel is equipped with signal lamps to indicate abnormal oil level, temperature, and gas pressure on each of the 100/24-kv transformers. Any abnormal condition, when detected by devices installed in the transformer, will cause a common alarm to be sounded in the control room.

The operator then must go to the alarm panel in the yard to determine which transformer is in distress and the nature of the trouble. None of these conditions, unless accompanied by sufficient fault current to actuate overcurrent or differential relays, causes tripping of the sectionalizing devices.

Each 100/24-kv transformer bank is protected by harmonic restrained differential relays and induction disc overcurrent relays.

The harmonic restrained differential relays are connected to current transformers on the 100-kv bushings of the power bank and to current transformers on the line bus side of the 24-kv bank breaker. These relays operate a self-reset auxiliary relay which seals in through an "A" contact in the 100-kv transformer gang switch.

The auxiliary relay trips the 100-kv OCB supplying the power bank, the 100-kv gang switch, the 24-kv bank OCB, and bus sections No. 6 and No. 7 tie OCB. After the 100-kv gang switch is opened, the auxiliary tripping relay resets and the 100-kv OCB recloses. This re-energizes the other bank supplied by this OCB.

An induction disc overcurrent relay connected to a current transformer in the bank 24-kv neutral acts as a backup relay for sustained ground faults on the 24-kv system. This relay operates the auxiliary relay as described above, and another auxiliary relay which trips all breakers connected to the 24-kv line bus.

This second auxiliary tripping relay blocks reclosing of the 24-kv line breakers and swapover from this bus to an energized bus. Swapover will be described later. This second auxiliary relay is hand-reset.

Induction disc overcurrent relays, both phase and ground, are connected to current transformers in the transformer side of the 24-kv bank OCB. These relays trip the 24-kv bank OCB and block swapover of this bus section to an energized bus.

24-kv line busses

Relaying of the 24-kv line busses consists of bus differential protection and "swapover."

The 24-kv line bus differential relays, both phase and ground, are induction disc overcurrent relays connected to current transformers in the transformer side of the 24-kv bank OCB and the line side of the 24-kv line OCB's. These relays operate a hand-reset auxiliary relay which trips all breakers connected to the 24-kv line bus, blocks reclosing of these breakers, and blocks swapover to another bus.

Swapover between the 24-kv line busses is described as follows:

Swapover, bus section No. 5 to No. 6—bus section No. 5 will swap to bus section No. 6 for loss of 100-kv supply to bank No. 5 or loss of bank No. 5. Bus section No. 6 must be energized for swapover to take place.

Swapover, bus section No. 6 to No. 5—bus section No. 6 will swap to bus section No. 5 for loss of 100-kv supply or loss of bank No. 6. Bus section No. 5 must be energized for swapover to take place.

Swapover, bus section No. 7 to No. 8 and No. 8 to No. 7—same as

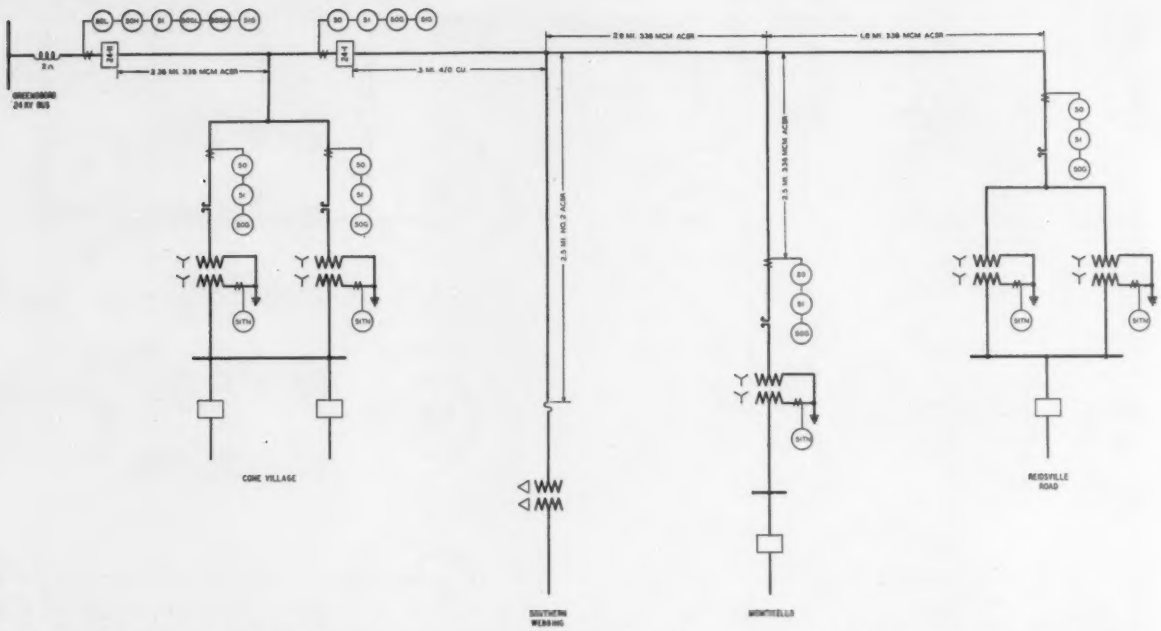


Fig. 3—Transformers at these substations are connected wye-wye and are grounded on the high and low tension sides.

bus section No. 5 to No. 6 and No. 6 to No. 5.

Swapover is affected by an instantaneous undervoltage relay supplied from the bank 24-kv bus of the de-energized section, a time delay undervoltage relay supplied from the line 24-kv bus of the de-energized section, and a time delay overvoltage relay supplied from the line 24-kv bus that is to supply the de-energized bus.

Time of swapover is five seconds. To swapover, the 24-kv bank OCB is tripped and the bus tie breaker is closed.

Swapover is blocked if (1) bus section No. 6 and No. 7 tie OCB is closed, (2) either bus section involved in the swapover is faulted, (3) the bus section is de-energized because of tripping of the transformer OCB by overcurrent relays, and (4) the bus section is de-energized because of failure of a line breaker to clear a line fault (shutdown of bus by operation of the relay connected in the 100/24-kv bank neutral).

24-kv lines (Figure 2)

All 24-kv line OCB's are equipped with induction disc overcurrent relays with instantaneous attachments, both phase and ground. All breakers are reclosing —some one-shot, instantaneous and others two-shot, instantaneous and 20 seconds delayed. The instantaneous attachments are blocked on part of the breakers after the first trip operation. On others, the attachments are in service for all trip operations.

One circuit is equipped with "pilot wire" relaying in addition to the overcurrent relaying as described above. This pilot wire relay operates over a line leased from the telephone company.

The OCB relays at the main station are set to coordinate with the sectionalizing equipment out on the lines except for air break switch operations and for tripping by instantaneous relays on the first operation only.

Air break switches are relatively slow in operation; sometimes even flash over when opening under fault conditions. This causes the 24-kv line OCB to trip along with the air break switch. Service is restored to other customers on the line by reclosing of the line OCB.

On the line OCB's equipped with instantaneous relays set to trip on the first operation only, the intent is to clear faults up to and beyond line and substation sectionalizing devices instantly and to restore service by immediate reclosure of the OCB.

Permanent faults beyond line or substation sectionalizing devices are cleared by operation of the line or substation device on the second operation. If this sectionalizing device is an air break switch, the line OCB at the main station will trip also, and will reclose after a delay of 20 seconds.

Typical lines are Circuits No. 24-11, No. 24-3, and No. 24-15. The relaying on these lines will be described in detail.

Circuit No. 24-11 (Figure 3)

This circuit supplies Monticello, Reidsville Road, Cone Village, and other substations. The transformers at these stations are connected wye-wye and are grounded on the high and low tension sides. The sectionalizing device on the 24-kv side is a spring-operated air break switch.

Monticello and Reidsville Road have similar relaying. Each has induction disc phase (very inverse) with instantaneous attachments, one attachment being connected as a ground relay.

The time delay phase relays are set to carry approximately 1.5 times maximum load and to coordinate with the low-tension circuit protection. The phase and ground attachments are set to protect 80 per cent of the bank impedance. These banks also have neutral relays, induction disc type.

A very inverse characteristic was selected to keep the time low, as the ground relays at Greensboro Main must coordinate with these neutral relays. The neutral relays are set to operate at a current value equal to load current on the heaviest loaded feeder.

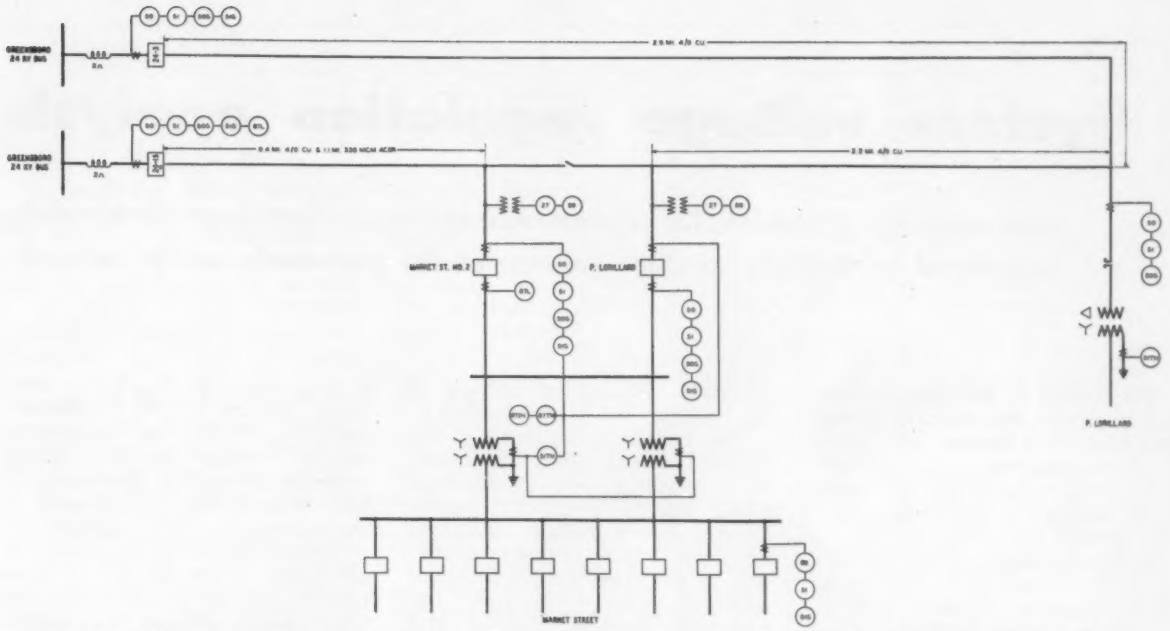


Fig. 4—At Lorillard Substation transformers are connected delta-wye. Market Street has two transformer banks.

Cone Village has two transformer banks with relaying on each similar to that described above. Either set of relays trips both air break switches. Just beyond the Cone Village Substation there is an OCB in the 24-kv line which was installed to give better service to a TV station supplied from the Cone Village low tension bus.

This OCB is two-shot, reclosing equipped with induction disc relays with attachments, both phase and ground. The attachments are set short of the highest low-tension fault on substations on this line and trip on the first fault only.

On OCB No. 24-11, at Greensboro Main Substation, the phase and ground relays are very inverse and are set to coordinate with the line OCB at Cone Village. OCB No. 24-11 has two sets of attachments, both phase and ground.

One set of attachments is set to reach beyond the Cone Village Line OCB and the other to reach short of the Cone Village line OCB. The high-set attachments are in service on all operations but the low-set attachments are in service on the first operation only. This OCB is one-shot reclosing.

Circuit No. 24-3 (Figure 4)

This circuit normally supplies one customer, P. Lorillard Co. At Lorillard Substation the transformers are connected delta-wye. The high-side sectionalizing device is a spring-operated air break switch. Induction disc overcurrent relays with instantaneous attachments are installed on this air break switch with one of the attachments being connected as a ground relay.

The time delay phase relays are set for twice maximum load and coordinate with customer protective devices on the low side feeders. The instantaneous phase relays are set to protect 80 per cent of the bank impedance. The instantaneous ground relay is set at a low pickup value as the 24-kv winding is delta connected.

An induction-disc overcurrent relay is installed in the low-voltage winding neutral. This relay has a low current setting and is timed to coordinate with the low side feeder relays.

At Greensboro Main the No. 24-3 OCB relays are very inverse, both phase and ground. The time delay relays are set to coordinate with the relays at the Lorillard Substation. The attachments are set to operate for faults into the bank at the Lorillard Substation and are in service on the first operation only as this line can be tied to other lines. This breaker is two-shot reclosing.

Circuit No. 24-15 (Figure 4) normally supplies Market Street Substation which has two transformer banks of 3-1,500 kva each. These transformers are connected wye-wye, 24/4.16-kv, paralleled and grounded on the high and low tension sides. For loss of voltage on circuit No. 24-15, Market Street Substation is swapped to circuit No. 24-3.

It is swapped back, without an interruption in service, to circuit No. 24-15 when normal voltage is restored to this circuit. Swapover and swapback are blocked when either of the tap OCB's is tripped for faults in the substation, or on feeders out of this substation.

The station protective relays on the Market Street Substation are similiar to those already described at the Monticello and Reidsville Road Substation. An additional relay — induction disc with instantaneous attachment — is installed as a ground differential.

Differential ground relaying is omitted at the stations which are controlled by air break switches because of inaccuracies inherent in our air break switch current transformers.

The 24-kv OCB's at Market Street are one-shot, instantaneous, reclosing. The instantaneous attachments are in service on all operations. The reclosers are blocked on swapover, tripping by the bank neutral relay, and tripping by the control switch.

Pilot wire relays are installed on the OCB on the No. 24-15 line.

(Continued on page 90)

System voltage regulation analysis

I—Operating schedules for system voltage regulation must be carefully engineered to maintain constant voltage at the customer's service entrance

By Arnold L. Samuels, Electrical Engineer, Kansas City Power and Light Co., Kansas City, Mo.

(This is the first part of a three-part article discussing the problems involved in operating a system voltage regulation plan.)

◆ System voltage is continuously being evaluated by the electric utility engineer to determine its effect on system operation. Certain alternatives in design and operation permit the control of system voltage regulation.

The purpose of this article is to obtain a basis for evaluating system voltage so that normal operating levels can be established to maintain satisfactory voltage at the customer's service entrance.

The discussion is limited to the variables which affect the transmission system and is explored under five headings: (1) establishing system voltage operating schedules, (2) relationship of voltage to the operation of interconnections between systems, (3) generator terminal voltage and steady state stability, (4) regulating the transmission system voltage to minimize line loss, and (5) var supply from remotely located generating stations.

The voltage requirements at the substation regulated bus vary over a wide range to maintain a constant voltage at the customer's entrance. Therefore, changes in system voltage should coincide with the demands of the substation bus to assist the tap changer in maintaining customer voltage.

Several factors require that each substation on the system be analyzed to determine its coordination with system voltage. Substations are located at different points on the system and will have a voltage at the transformer primary terminals which will depend upon the high-voltage transmission voltage profile or regulation.

The primary voltage, together

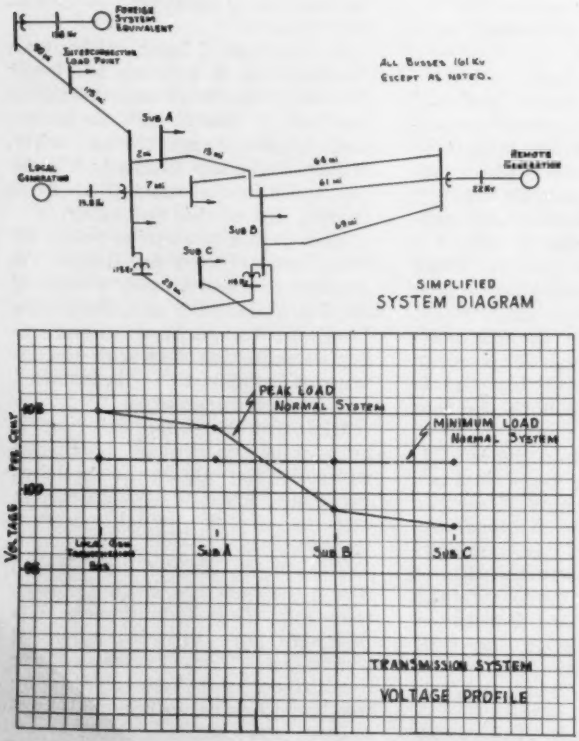


Fig. 1—This is the generation and transmission system used in the analysis, with a voltage profile at three substation locations where voltage limits will be found.

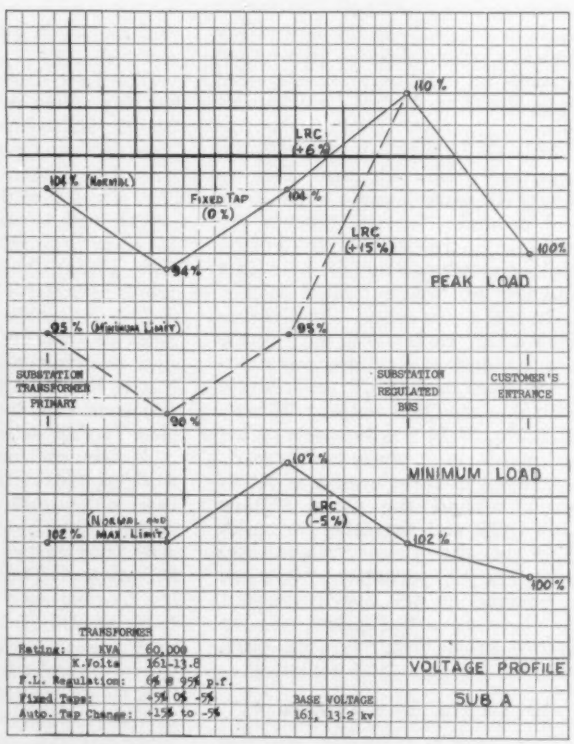


Fig 2.—The substation A profile begins at the 161-kv substation transformer primary terminals and extends to customer's entrance. Peak and minimum loads are shown.

with the range available in the automatic tap changing equipment of the substation transformer, affects the selection of a transformer's fixed taps. It is the object of this discussion to show the advantage of selecting fixed taps so that the regulator will operate at a minimum boost position during substation peak loads.

At the same time, during periods of minimum substation load, the fixed tap selected should permit the regulator to have sufficient buck taps available to regulate the substation bus to the necessary level.

If both conditions are attainable, having unused boost taps during maximum load and sufficient buck taps at light load, two system voltage operating limits can be established.

The first limit is an "on peak, minimum voltage limit." During substation peak loads, a minimum system voltage limit is obtained for the high-voltage bus which is at a point where the substation tap changer will utilize all of its available boost positions so that customers' normal voltage will be maintained.

Knowledge of this "on peak, minimum voltage limit" is useful when studying the severity of system contingency conditions as it is possible to more nearly predict what the customer's voltage will be during an outage. When a system adversity occurs, the per cent by which the limit is below the normal transmission operating voltage will depend upon system design.

The coordinated selection of fixed taps, however, will establish the greatest margin attainable, thereby producing a system with a maximum tolerance for adversities which cause transmission voltages to go below normal.

The second voltage limit is a "minimum load, maximum voltage limit." At substation minimum loads, voltage regulation in the transmission and distribution systems is at a minimum. When this is the case, there is a limit to how high the voltage on the primary side of substation transformers can rise and still not exceed the tap changer full buck position and normal voltage measured at the customer.

This limiting voltage which utilizes the full buck of the automatic regulating equipment is defined here as the "minimum load, maximum voltage limit."

If this limit is determined for each substation, the transmission system voltage schedule, as controlled from generator excitation, will be adjusted during minimum load periods to keep substation primary voltages at or below the prescribed limit.

The purpose of the graphical analysis is to test the system voltage operating schedule in terms of the normal voltage to be maintained at the customer. A study of all the substations on the system has, as an objective, the coordinated setting of fixed taps to fully utilize the benefit of the automatic tap changer.

An additional objective is to obtain the system voltage limits for maximum and minimum substation loading.

A diagram of the generation and transmission system used in the analysis is shown in Figure 1. Also included is a voltage profile at three substation locations on the system where voltage limits will be determined. The voltages were taken from network analyzer load flow studies for the coming year's maximum and minimum load

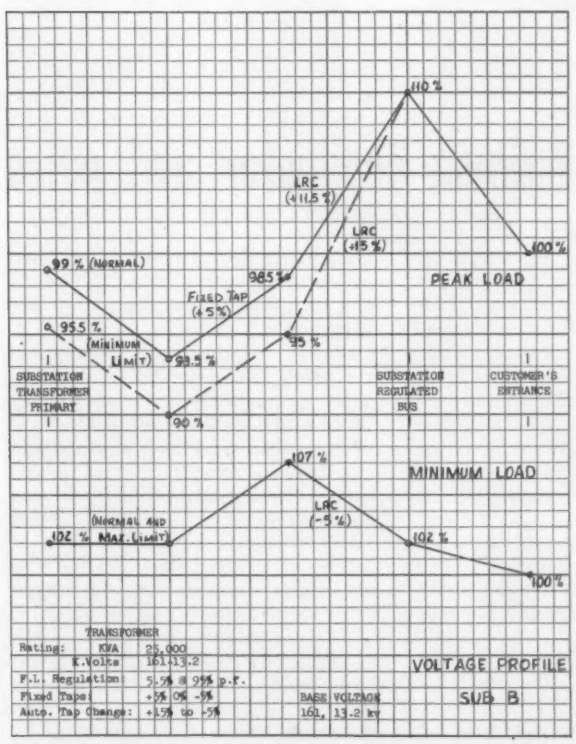


Fig. 3—The location of substations B and C is indicated on the transmission system illustrated in Figure 1. The transformer turns ratio is different at substation B.

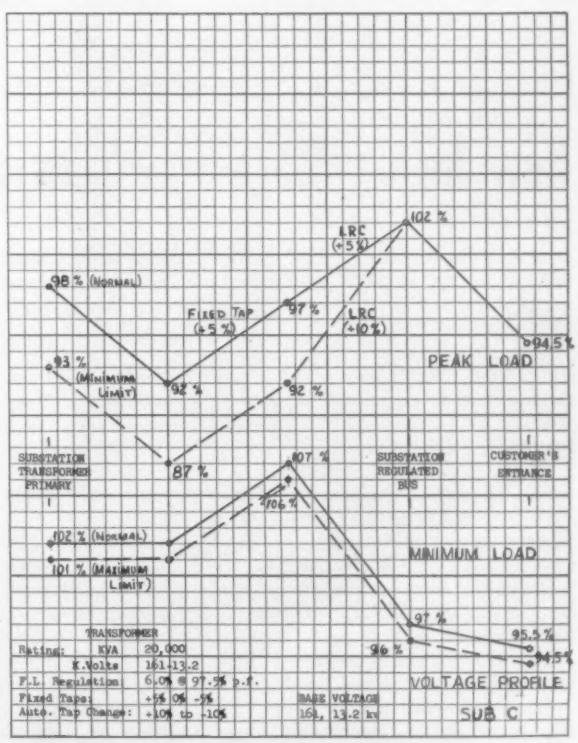


Fig. 4—Substation C serves a 12.46-kv system and has an LRC range which differs from transformers at substations A and B. Voltage limits at all three are similar.

periods with the system operating normally.

Figure 2 is a voltage profile for substation A beginning at the 161-kv substation transformer primary terminals and extending to the customer's entrance. The regulation is divided into four elements: (1) voltage regulation in the substation transformer; (2) regulation due to the transformer turns ratio; (3) regulation from automatic tap changer; and (4) regulation in the distribution system consisting of (a) distribution circuit up to an equivalent load point, (b) distribution transformer, and (c) secondaries and service.

A plot of the *peak load* voltage profile is shown in Figure 2. The substation transformer voltage drop was determined by using the expected coincident demand on peak of 50 mva at a capacitor corrected power factor of 95 per cent.

Three fixed taps are available, a nominal 13.8-kv tap and one tap five per cent above and below rated voltage. The tap changer is plus 15 per cent and minus five per cent as related to the 13.8-kv side of the transformer.

Regulation in the distribution system between the substation regulated bus and the customer's entrance was assumed to be ten per cent. Specific application of this method will require that a value of distribution regulation be picked which is representative of the distribution system under study.

The minimum load voltage profile for the same transformer is also plotted in Figure 2. Unity p.f. load was estimated at one-fifth the peak level so that the voltage drop in the transformer was neglected. The same fixed tap position was used for minimum load as was assumed for peak load.

Distribution system voltage drop was estimated to be a minimum of two per cent volts. This value should also be representative of the system characteristics.

The voltage profiles are drawn beginning at the normal voltage level expected to occur at the substation primary terminals for the load level being considered. As stated earlier, the selection of the transformer fixed tap position (1) will leave a margin of regulation available above the tap changer operating point on system peak load. This will maintain voltage to the customers when contingency conditions lower system voltage. It will (2) permit normal voltage to be maintained at the customer's entrance during substation minimum load and the transformer tap changer will be as near the full buck position as possible.

In the example of Figure 2, the nominally rated fixed tap was selected.

The position taken by the tap changer at the two levels of load was charted to determine whether the selection of the fixed tap was in accordance with the objectives in (1) and (2) above. In Figure 2, a six per cent boost by the tap changer was necessary to supply 100 per cent voltage to the customer on peak.

At minimum load the five per cent inherent boost from the transformer turns ratio was not overcome by voltage drop due to load and the tap changer operates to reduce the voltage five per cent. As previously stated, the voltage drop in the distribution system is two per cent during minimum load.

Judging by the positioning of the tap changer, the requirements at both load levels have been fulfilled, indicating the correct selection of the fixed tap.

It is now possible to observe the "maximum load, minimum voltage limit" at substation A. A total of 15 per cent boost above nominal rating is available in the tap changer. At maximum load, when normal voltage exists at the substation primary terminals, nine per cent boost remains unused in the regulator.

The voltage at the substation

(Continued on page 90)

New high-voltage line uses aluminum conductor and poles

◆ A new major electric distribution center, along with approximately 3¼ miles of high-voltage transmission line, has been constructed and placed in service in the West Bank area of New Orleans and the adjacent community of Gretna by Louisiana Power & Light Co.

D. W. Robbins, district manager for LP&L in the Algiers section of New Orleans and Gretna and other nearby communities, said the electric distribution center is located at the intersection of General De Gaulle and Holiday Drives in New Orleans.

The distribution center is the terminal point for the new high-voltage (115-kv) transmission line which has been constructed from another electric distribution center in Gretna.

The manager explained that the project answered a two-fold purpose: to continue the improvement of electric service in this growing area, and to provide additional power for the area's future needs.

Mr. Robbins said the new electric distribution center utilizes the latest engineering innovations and designs, and that the site is being landscaped in keeping with the expected residential structures of the area.

The new center and line were placed in operation June 7. The center has one 20,000-kva transformer now; a second transformer of 33,000-kva capability is scheduled to be installed in September, Mr. Robbins said.

He pointed out that the new high-voltage transmission line, constructed for most of its length along General De Gaulle Drive, features 85-foot high aluminum structures, sky-blue insulators, and graceful upswept arms to which the insulators and conductor are attached.

Each ornamental, octagonal structure is supported by one 54-inch prestressed concrete piling 20 feet in length. These pilings are of the same type used to construct the 24-mile long causeway across Lake Pontchartrain, and in the 230-kv line recently constructed by LP&L across the lake.

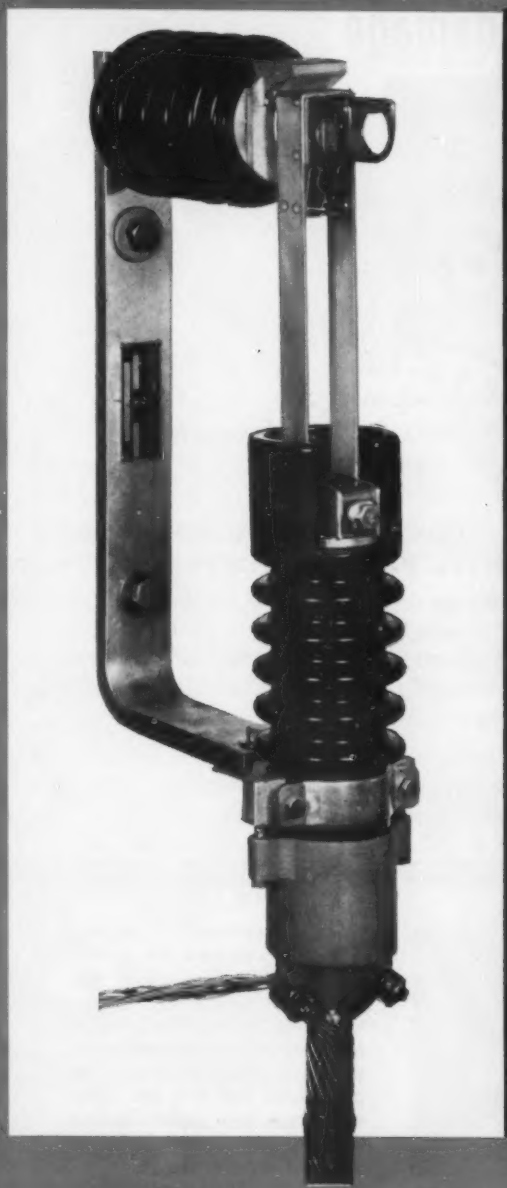
The structures are designed to withstand winds of hurricane velocity with ample safety.

The aluminum conductor used in constructing the line is 1,468 MCM 36/1 ACSR, and was compressed during its manufacture to eliminate air spaces between strands. This is the first time this innovation has been used by an electric utility.

JOSLYN

PSC Cable Terminal

Preform Stress Control



A NEW MEANS FOR TERMINATING HIGH-VOLTAGE CABLE with built-in stress cone and air-excluding sealing system. The installation is simple and rapid.

A PREFORMED STRESS CONE provides corona-free dielectric grading within the metal base and rugged porcelain housing.

UNIQUE DESIGN permits space and cost economies without reducing performance margins.

PSC COMBINATION WITH REMOVABLE BLADE SWITCH (illustrated) provides additional space economy and much-needed safety features.

FOR ADDITIONAL INFORMATION on the new Joslyn PSC Cable Terminating Equipment write or ask your Joslyn Representative for Product Information Bulletin 146.

JOSLYN COMPLETE POLE LINE EQUIPMENT

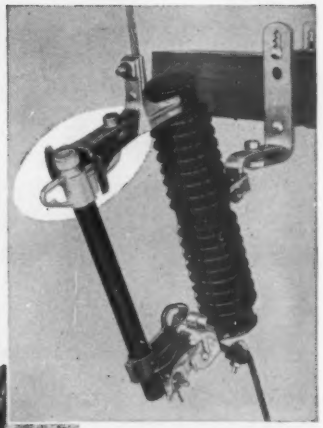
JOSLYN MFG. AND SUPPLY CO., 155 N. WACKER DRIVE, CHICAGO 6, ILLINOIS

For more details on above items, use reply card on page 21

"FOLLOW-ACTION" CONTACTS

OF KEARNEY "GX" CUTOUTS

...eliminate danger of external arcing
...prevent recoil damage



KEARNEY

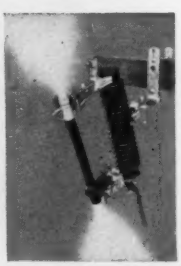
"FOLLOW-ACTION"

LOCKS CONTACTS CLOSED UNTIL FAULT IS INTERRUPTED

Stainless steel springs in the top contact assembly of the Kearney GX cutout, absorb shock... and by "following" any motion of the cartridge created by recoil impact, keep the top contacts firmly locked together under high pressure until the fault has been interrupted. Contacts cannot separate during interruption to cause external arcing or contact burning.

Ball and socket contacts are self-aligning, cannot be bent or twisted out of alignment by severe faults, and always seat properly regardless of the angle of cartridge close-in. Dependable, safe operation is assured.

Balanced Double Venting . . . prevents recoil damage. Expendable cap blows on high faults. Expulsion gases discharge from both ends of the GX cartridge to equalize pressure and neutralize recoil shock. At the same time, relief of excess pressure within the cartridge prevents tube bursting. On low amp faults, the GX cartridge single-vents from the bottom only, assuring ample gas pressure for positive interruption.



Cast Bronze Hood . . . prolongs cutout and contact life by protecting top "follow-action" contacts from severe weather and ice. Hood also shields contacts from dirt and corrosive elements, providing added insurance of dependability and long life. Extra-wide entry jaws guide cartridge securely into contacts even at awkward close-in angles.

Contact your Kearney Sales Representative or write for Bulletin 1A.

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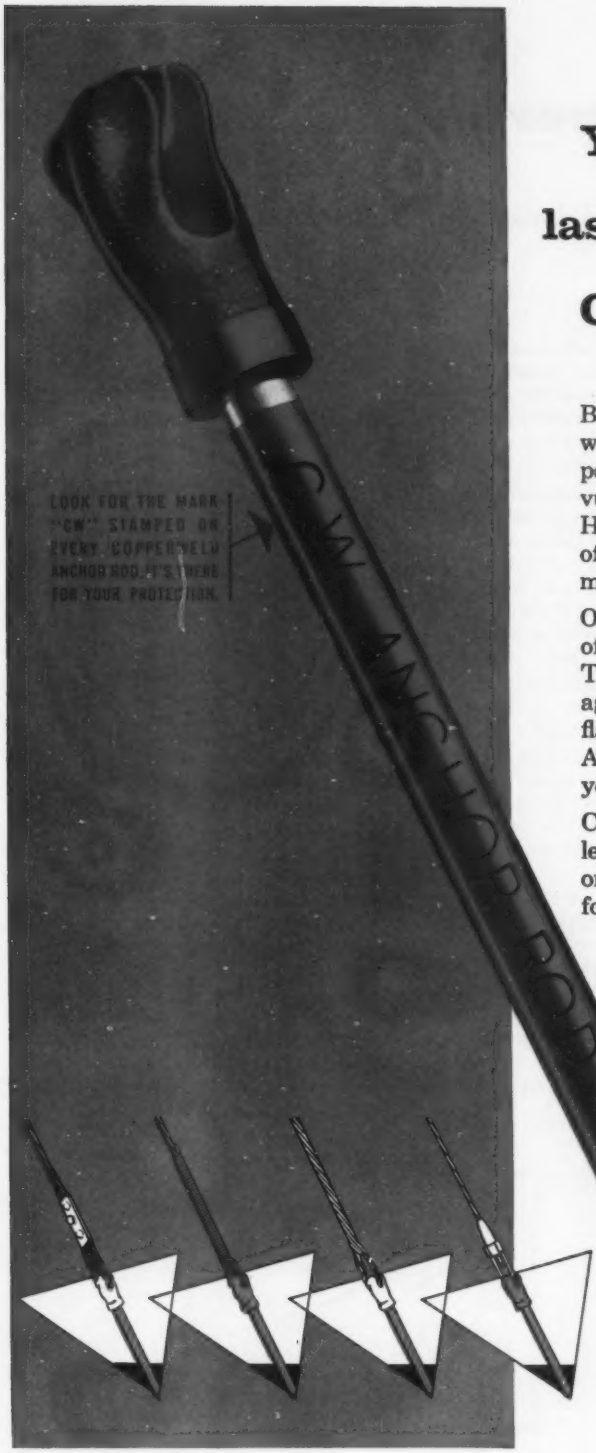
812

For more details on above items, use reply card on page 21



You get lasting security with Copperweld Anchor Rods

Because an anchor rod is used in the ground where its entire length cannot be seen, its holding power is often taken for granted. Yet, anchor rods are vulnerable—primarily at or just below the ground line. Here, the rods are subject to rusting and loss of strength due to the action of corrosive soils, moisture and air carried down by surface waters.

Only Copperweld Anchor Rods have a thick covering of copper molten-welded to a strong steel core. This method of manufacture assures lasting protection against corrosion. Since the copper cannot crack, flake or peel, the strong holding power of Copperweld Anchor Rods is always the same . . . protecting your overhead lines year in and year out.

Copperweld Anchor Rods are available in various lengths and diameters. For complete information on these non-rusting anchor rods, write for Engineering Bulletin E. D. 1883.

COPPERWELD STEEL COMPANY
WIRE AND CABLE DIVISION *Glassport, Pa.*
For Export: COPPERWELD STEEL INTERNATIONAL COMPANY, New York

FERROUS OR NON-FERROUS FITTINGS CAN BE USED WITH COPPERWELD ANCHOR RODS.

The threaded ends of each Copperweld Anchor Rod are heavily coated with pure tin to permit the use of ferrous or non-ferrous fittings.

Copperweld®

anchor rods

For more details on above items, use reply card on page 21

Application and operation of voltage

Some problems concerning band width and line-drop compensation

By Thomas J. Sillers, Regulator Dept., Allis-Chalmers Manufacturing Co., Milwaukee, Wis.

(This is part I of a two-part article by Mr. Sillers. Part II will appear in a subsequent issue.)

◆ Experience has shown that it is most economical to generate power in large blocks, transmit it at very high voltages to minimize losses, and transform it to low voltages for feeding to individual customers in small quantities.

However, every electrical machine and element is subject to internal voltage drop, which means the output voltage, or the voltage that appears across the output terminal of any such electrical device, changes with load.

Because of these changes in output voltage, it has become necessary to apply voltage regulators to electrical systems. Generally, the application of voltage regulators is relatively simple, but certain questions and problems do arise.

Difficulties are sometimes encountered when trying to evaluate the narrow band widths possible on modern distribution regulators. Now that distribution regulators are available with small ⅝ per cent steps, it is possible for them to operate on narrower band widths without hunting. The result is improved operation.

Band width settings possible on a voltage regulator are determined by the size of regulator step. The smallest possible band width would be equal to one step, since a smaller one would cause hunting. A one-step band width is impractical because any small increase in the size of the step will also lead to hunting.

Practically speaking, a band width somewhat larger than a one-step or a two-step voltage band is the smallest practical. For regulators with ⅝ per cent steps this would be a band width of 1¼ per cent.

By examining a distribution system with an established tolerance between the highest voltage allowable on the first distribution transformer and the lowest voltage allowable on the last distribution transformer, the advantages gained by utilizing a narrower band width can be determined.

Figure 1 shows the voltage profile of a system with a band width BW-1. The sum of the band width and the voltage drop (I_1Z_1) must equal the voltage tolerance allowed (V max — V min).

Figure 2 shows the voltage profile of the same system but with a narrower band width BW-2 and a larger voltage drop (I_2Z_2), so that the point of the lowest allowable voltage is at the same distance as in Figure 1, (D_2 equals D_1). How much more load can the system in Figure 2 carry?

The sum of the band width and voltage drop in each system must equal the voltage tolerance:

$$BW_1 + I_1Z_1 = BW_2 + I_2Z_2$$

Since $D_1 = D_2$ then $Z_1 = Z_2$

and

$$I_2 - I_1 = \frac{BW_1 - BW_2}{Z_1}$$

Also

$$BW_1 + I_1 Z_1 = V\,max - V\,min$$

Dividing the two equations, we get

$$\frac{I_2 - I_1}{I_1} = \frac{BW_1 - BW_2}{V\,max - V\,min - BW_1}$$

Multiplying by 100, the per cent load increase is equal to the difference between the original band

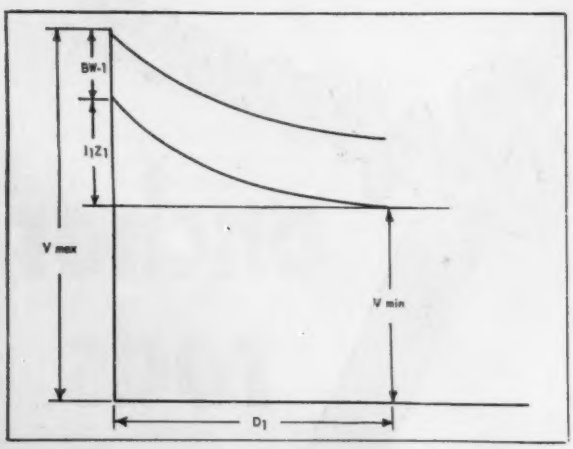


Fig. 1—This shows the voltage profile of a system with a band width BW-1. The sum of the band width and voltage drop must equal the voltage tolerance allowed.

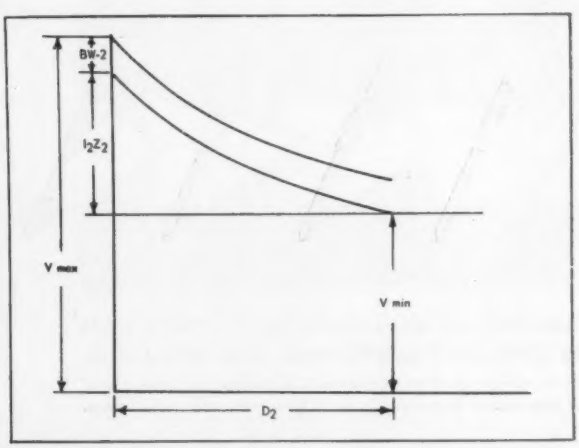


Fig. 2—This profile of the same system has a narrower band width but a larger voltage drop so that the point of lowest allowable voltage is at the same distance.

regulators

are examined

width and the new band width multiplied by 100, all divided by the difference between the voltage tolerance and the original band width.

To show how appreciable this can be, substitute values for a system with a ten per cent voltage tolerance where the band width changed from four to two per cent. The possible load increase equals

$$\frac{4 - 2}{10 - 4} \times 100 \quad \text{or } 33\tfrac{1}{3}\%$$

The curves of Figure 3 show the increased loads possible when band width is reduced to 1¼ per cent, or two ⅝ per cent steps.

The possibility of extending the feeder is also made possible by a narrower band width, although a different expression is needed for the amount of increase permissible.

Examine Figures 1 and 2 again, and this time let D_2 carry additional distributed load until the voltage reaches a minimum allowable (V min). How much can D_2 increase?

Assuming equally distributed load, the current I_1 is proportional to the distance D_1 as is the impedance, Z_1. Therefore, the voltage drop I_1Z_1 is proportional to the distance D_1^2. Likewise, the voltage drop I_2Z_2 is proportional to D_2^2.

$$\frac{D_2^2}{D_1^2} = \frac{I_2Z_2}{I_1Z_1} = \frac{V\ max - V\ min - BW_2}{V\ max - V\ min - BW_1}$$

$$\frac{D_2}{D_1} = \frac{V\ max - V\ min - BW_2}{V\ max - V\ min - BW_1}$$

and

$$\frac{D_2 - D_1}{D_1} = \frac{V\ max - V\ min - BW_2}{V\ max - V\ min - BW_1} - 1$$

$$\text{Increase in feeder length} = \frac{\text{Voltage tolerance} - \text{New band width}}{\text{Voltage tolerance} - \text{Old band width}}$$

Curves of Figure 4 show the possible increase in feeder length with additional distributed load when various band widths are reduced to two ⅝ per cent steps.

Because the regulator is always located at the loadcenter on a particular feeder, it is necessary to

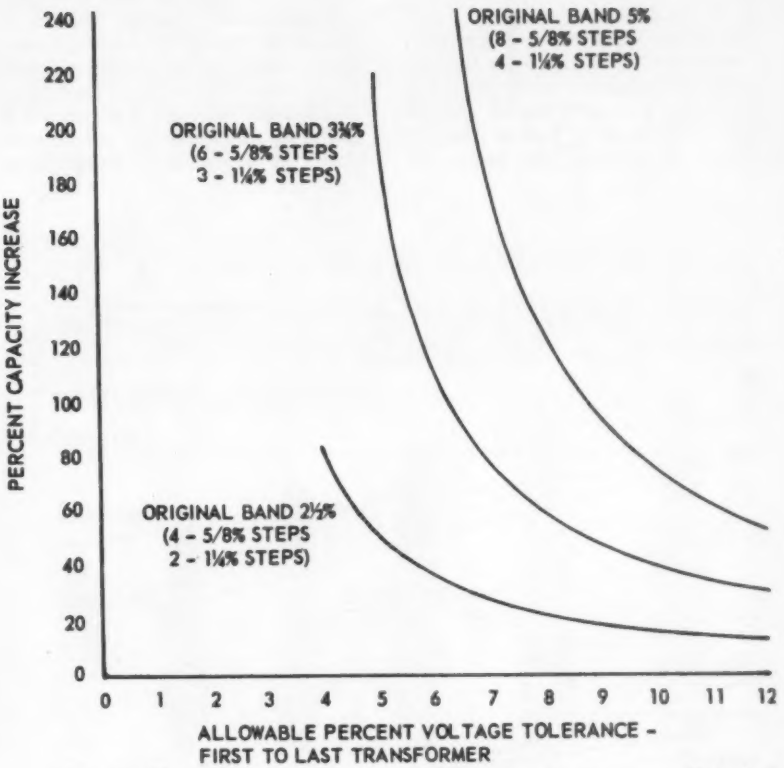


Fig. 3—These three curves show the increase in line capacity when band width is narrowed to 1¼ per cent, or two 5/8 per cent steps. Load is uniformly distributed, and feeder length is held constant.

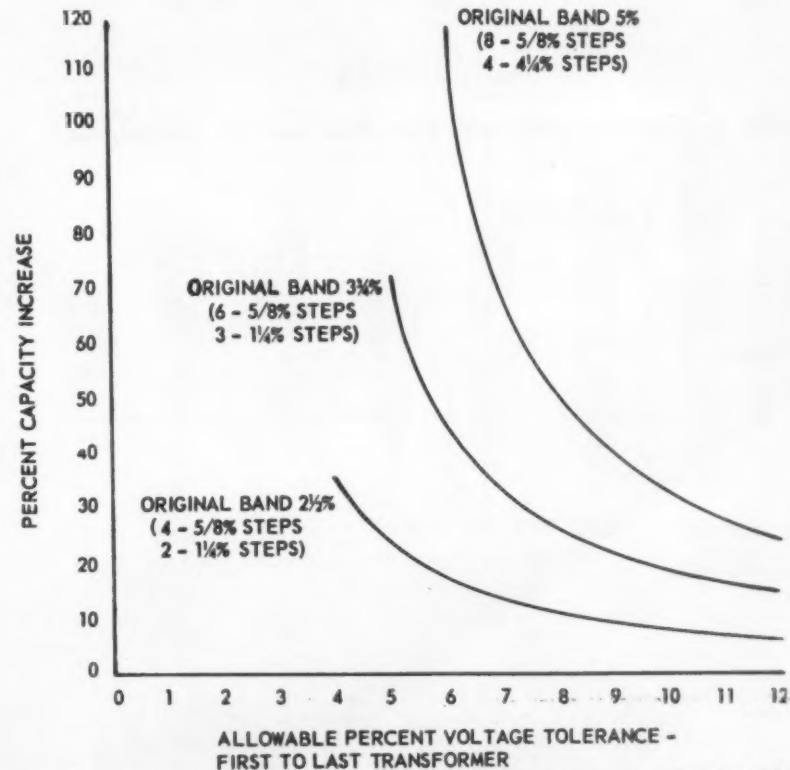


Fig. 4—The curves show the increase in line capacity when band width is narrowed to two 5/8 per cent steps, with added feeder length.

add a line-drop compensator to the control circuit.

With the line-drop compensator, a regulator can minimize the effects of resistance and reactance line drops and give better voltage at the loadcenter. Better average voltage at other points along the distribution lines is also obtained.

A uniformly loaded system is shown in Figure 5A with the regulator and the line resistance and reactance. The voltage profile of the system without compensation is shown in Figure 5B. At no load there is negligible voltage drop with maximum drop occurring at full load.

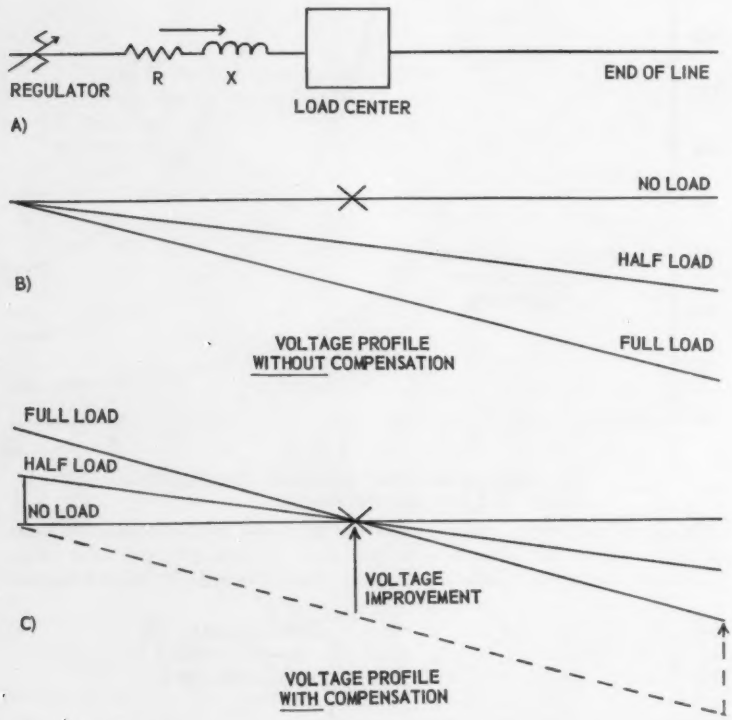


Fig. 5—These are profiles with and without regulator compensation.

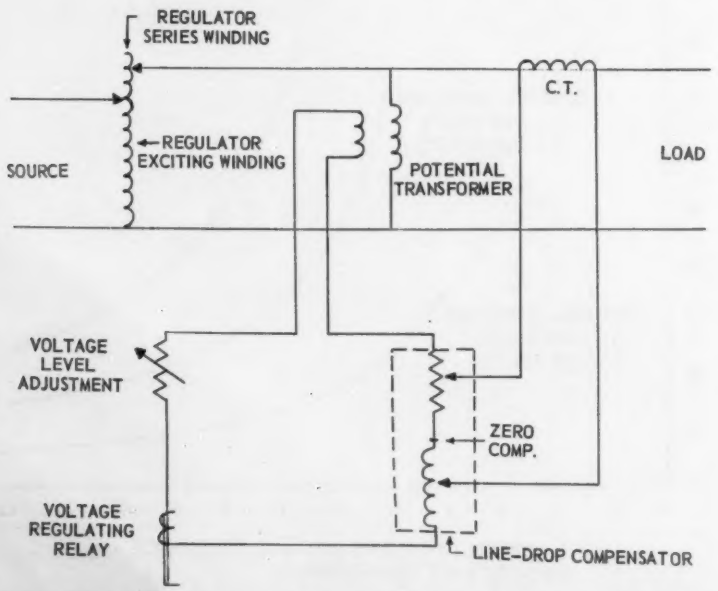


Fig. 6—This regulator control diagram shows line-drop compensator.

Figure 5C shows the same profile when compensation has been properly incorporated in the regulator control. The extensive area of voltage improvement shown in the dotted line area indicates the benefits of compensation.

In using compensation, it must be remembered that the voltage drop is a function of load current; it is therefore necessary to measure this current. For standardization and to allow interchangeability in the field, the secondary current corresponding to full-load current is a fixed value regardless of regulator rating.

In addition to the current transformer, a resistor and reactor are added to the regulator control for the compensator circuit. These two circuit elements are variable and adjusted to supply the necessary values to each individual application. A simplified control diagram is shown in Figure 6.

Components in Figure 6 labeled "Voltage Level Adjustment" and "Voltage Regulating Relay" are a part of the control circuit. The resistance and reactance elements for the compensator are in series with these two components.

With compensation, current from the current transformer flows through a portion of the resistance and reactance elements of the compensator and a voltage drop is introduced into the control circuit. This voltage adds to or subtracts from the voltage in the voltage regulating relay and causes the regulator control to raise or lower the regulator output voltage.

By properly applying resistance and reactance elements, the voltage rise or drop in the regulator control circuit will be proportional to the drop in the line caused by load currents, resistance, and reactance. The regulator will then maintain a constant voltage at the selected loadcenter and also reduce voltage swing at the end of the line.

Calculation of correct compensator setting is based upon the size and spacings of conductors and the distance to the loadcenter. When these values are known, they can be substituted into formulas supplied by the manufacturer to determine the proper compensator settings.

There are limitations that should be considered when applying compensation. Basically, the idea behind compensation is to

(Continued on page 91)

JOSLYN MANUFACTURES

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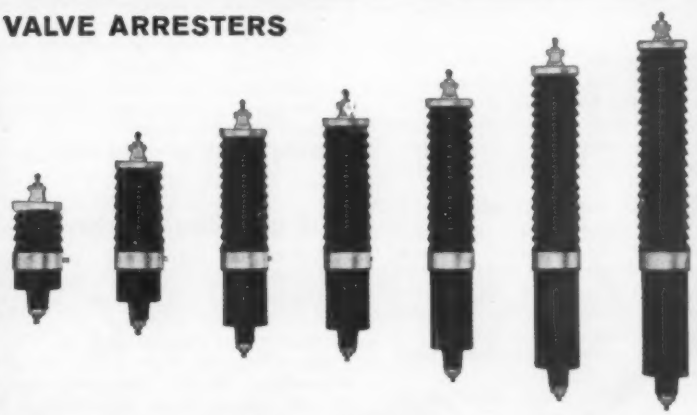
EXPULSION AND VALVE ARRESTERS

Because There Is A Right Place For Each Type

EXPULSION ARRESTERS

Use where lightning is frequent and severe—where system short-circuit currents are moderate. The ideal rural arrester!

VALVE ARRESTERS



Use where high system short-circuit currents require the use of valve type arresters. The ideal arrester for densely-populated urban areas.

JOSLYN COMPLETE POLE LINE EQUIPMENT

JOSLYN MFG. AND SUPPLY CO.

155 North Wacker Drive, Chicago 6, Illinois

New utility equipment

Fisher-Pierce light controls

A new photoelectric street light control with a simplified circuit has been announced by the Fisher-Pierce Div., Sigma Instruments, Inc, 170 Pearl St., S. Braintree 85, Mass. The model 6620 control is a refinement of the F-P tubeless model 6600A, using the same proven, hermetically sealed cadmium sulfide photocell and the same lightning protection.

The control also includes a new, fully tested Sigma true a-c relay which permits elimination of rectifier and capacitors.

Another new control, the model 6650, is intended for use in controlling farm lighting and for other applications in which a 500-watt capacity is sufficient. Its lower cost makes the 6650 ideal for utilities, REA's, and cooperatives in the promotion of farm and suburban lighting.

Both new controls conform to EEI-NEMA specifications and may be used with numerous popular luminaires. Models are available for mounting on bases up to 3-3/4 inches in diameter. In addition, a wide variety of Fisher-Pierce adapters is available to permit crossarm, pole-top, or bracket mounting.

Write U-701 on reply card, pg. 21

Greenlee single-twist bits

A new line of Greenlee bits designed to enable telephone and utility linemen working on poles or platforms to use impact wrenches for hole-boring as well as nut-tightening operations is now on the market from Greenlee Tool Co., 2136 12th St., Rockford, Ill.

These new No. 159-W single-twist bits feature a heavy 1-5/8-inch long hex shank that fits any standard 5/8-inch impact wrench adapter. A deep retaining recess in the shank snap-locks the bit into the quick-change chuck on the impact wrench.

The outlining spur design permits smooth, deep-hole boring. A coarse screw point, one spur, and one side lip help assure long service life under adverse working conditions. The new impact wrench bits are available in 11 stock sizes for boring holes ranging from 3/8 to 17/16 inches in diameter and up to 18 inches deep.

Write U-702 on reply card, pg. 21

S&C potential device

A new potential device for monitoring voltages in the 23- to 161-kv ranges is now on the market from S&C Electric Co., 4435 N. Ravenswood Ave., Chicago 40, Ill.

The potential device, costing typically 65 per cent less than most comparably functioning potential transformers, is designed to (1) sense voltages for automatic switching, (2) detect grounds, (3) indicate voltage through indicating lights or meter instruments, (4) supply potential for certain relays, and (5) provide battery charging energy.

Write U-703 on reply card, pg. 21

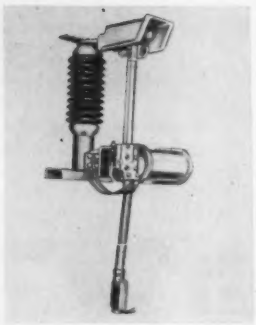
I-T-E grounding switches

Automatic high-speed grounding switches designed to trip remote breakers are being introduced by I-T-E Circuit Breaker Co., 1900 Hamilton St., Philadelphia 30, Pa.

Known as the type HSG, the new grounding switch features closing speeds ranging from 3.3 cycles at 15 kv up to 19 cycles at 230 kv. It is available in voltage ratings from 15,000 through 230,000 volts with momentary ratings of 20,000 and 40,000 amperes.

Two torque ratings are offered for the tripping mechanism. For ratings of 15 kv up through 69 kv, the torque rating is 1,000 inch-pounds, and for 115 kv through 230 kv, the torque rating is 2,000 inch-pounds.

The switch consists of an aluminum blade which provides a low moment of inertia with tinned copper replaceable contacts; copper



spring pressure jaws with sleet shield; and a compact, trip-free spring operating mechanism with an actuating solenoid and a six-circuit auxiliary switch. The blade is reset in the open position with a hook stick or by a remote operating handle and linkage.

Write U-704 on reply card, pg. 21

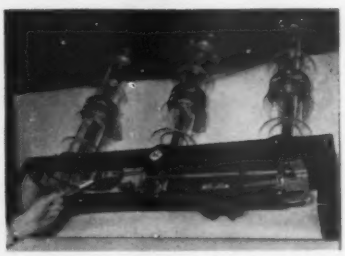
Vacuum capacitor switch

Availability of a motorized operator for its type VSC, three-phase, 15-kv, 300-ampere, vacuum capacitor switch has been announced by Allis-Chalmers Manufacturing Co., 938 S. 70th St., Milwaukee 1, Wis.

The new motorized operator may be powered from a source of 115 volts a-c, 125 volts d-c, 230 volts or 250 volts d-c. Its motor draws between 0.2 and 0.8 ampere.

The motorized operator requires considerably less control power than the optional solenoid operator initially offered on this switch.

The vacuum interrupter is sealed, and the switch which operates in all weather is available with four



auxiliary contacts as standard—two for close and open cut-off service, two for use on circuitry. A total of eight auxiliary switches can be accommodated in the operator housing. The switch weighs only 100 pounds and its parts are interchangeable between phases.

Write U-705 on reply card, pg. 21

Delta-Star transformer

A new distribution transformer with a completely new core design and an aluminum strip low voltage winding has been devloped by H. K. Porter Company, Inc., Delta-Star

Your best conductor protection is **ARMOR RODS**
and the best armor rods are

FANNER Superforms*

SUPERFORMED BY THE WORLD'S FIRST MAKER OF MACHINE-MADE ARMOR RODS

plus values in
RESEARCH/DEVELOPMENT
Punishing tests, indoors and outdoors, are constantly conducted for product improvement and new developments.

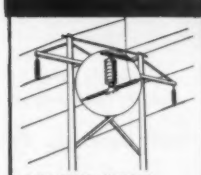
plus values in
RAW MATERIALS
Exacting tests and material inspection assure the finest quality in all Fanner Superformed products.

plus values in
PRECISION MANUFACTURE
Scrupulous care in manufacturing, in testing, in handling and in packaging assure on-the-job dependability.

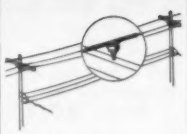
Of course you use armor rods for their economy and safety in construction, maintenance and repair of overhead lines. But, above all, you buy them because they are the most *dependable* accessory yet developed for protecting overhead conductors against wind-induced vibration at supporting points.

Fanner Superforms are of the highest quality. At every step . . . in development, materials, manufacture and packaging . . . Fanner takes extra care to give you the finest armor rods available, *at no extra cost*. Ask our representative for details. He will give you *plus assistance with your T & D problems*, too!

A FEW FANNER Superforms AND FINEST PLASTIC PRODUCTS

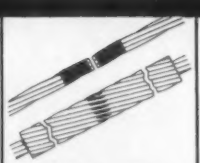


ARMOR RODS
. . . Protect long spans at supports



LINEGUARDS
. . . Protect short spans at supports

FANNGRIPS
. . . For dead-ending strands or conductors



FANNSPLICES
. . . For joining or patching strands

TREEGUARDS
. . . Protect conductor surface covering

KOVER-GARDS
. . . Protect surface-mounted conductors

*A superior forming method in accordance with Patents No. 2,769,478 and 2,588,663—other patents applied for.

THE FANNER MANUFACTURING COMPANY
Brookside Park • Cleveland 9, Ohio

DIVISION OF TEXTRON, INC.

Fine Fanner Superformed Products

A-3035A

Electric Div., 2437 Fulton St., Chicago 12, Ill.

Advantages of the new design include lower weight, reduced hot spots, increased short circuit strength, and longer life.

The new coil design incorporates an aluminum strip low voltage winding as compared to rectangular cross section copper magnet wire. The aluminum strip varies in width from approximately six inches on the smallest kva's to 15 inches on the larger sizes.

The broad surface of the aluminum strip keeps temperature gradients to a minimum. Hot spots are minimized. The aluminum strip balances ampere-turn distribution between high and low voltage windings.

Because of this, axial (vertical) forces are practically eliminated, enabling these units to withstand higher short-circuit currents than conventional copper wire designs.

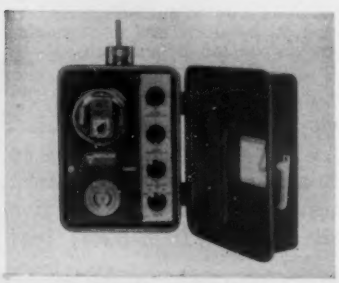
Insulation life is increased with no change made in the insulation itself.

Write U-706 on reply card, pg. 21

L-M control sensing device

Electronic sensing devices have been developed by Line Material Industries, McGraw-Edison Co., Milwaukee 1, Wis., specifically for use on RSD, distribution type regulator controls.

They provide simple, rapid, and accurate setting of band-width limits. Turning one knob to the desired band width simultaneously sets both



upper and lower limits. No external instruments are required because a readily visible scale provides accurate calibration in one-volt increments from plus and minus one to plus and minus six volts.

Two neon lamps indicate when voltage is outside of band width. One lamp lights for high voltage; one lamp lights for low voltage.

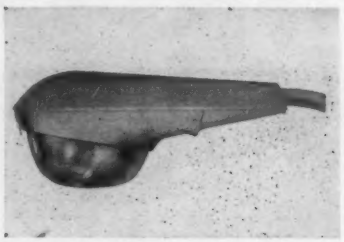
Solid-state, electronic components are used in the device to sense voltage and control a shaded pole motor-driven integrator. Because there are no contacts or moving parts, the electronic sensing device is maintenance free. Also, the accuracy of the device does not change with usage.

Write U-707 on reply card, pg. 21

Westinghouse roadway lamps

A new roadway lighting luminaire for 700- and 1,000-watt clear- and color-corrected mercury lamps is now available from the Westinghouse Electric Corp., Lighting Div., Edgewater Park, Cleveland, Ohio.

The new unit, designated the type OV-50 Silverliner, has been specially designed for illuminating extra-wide



roadways which have heavy traffic density. It also has wide application in parking lots and shopping plazas.

The OV-50 has an optical system that directs light to a large area on the roadway for uniform lighting. A unique latch allows easy access to the lamp and also provides a tight seal to keep out bugs, dirt, and moisture. The fixture's textured aluminum finish resists heat, abrasion, and corrosion.

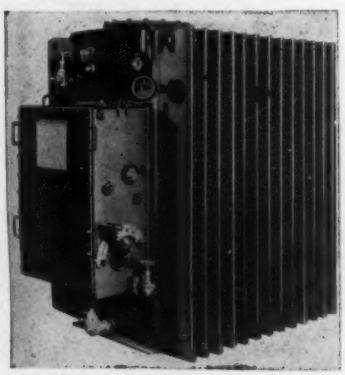
Two styles of the luminaire can be supplied—one with a built-in regulated output ballast and the other designed for remote ballast operation. The unit with the built-in ballast has a capacitor housing which fits on the top of the luminaire. Provisions have been made in the design of the luminaire so that each lamp can be controlled by a photocell.

Write U-708 on reply card, pg. 21

Wagner network transformer

Compact network transformers, designed to fit into close quarters, are now offered in 300- through 2,500-kva ratings by Wagner Electric Corp., 6400 Plymouth Ave., St. Louis 33, Mo.

Space-saving features of these transformers permit uprating existing secondary network systems by



installing higher transformer ratings in present vaults, and also permit lower construction costs on new systems.

These transformer enclosures have corrugated walls to provide smooth radiating surfaces free from dirt-catching corners, permitting easier cleaning and painting when required. An anti-corrosive finish and a special asphalt base undercoating provide years of protection even under adverse conditions in underground vaults.

A compact liquid-filled high voltage rotary switch with matching cable termination compartment is welded to the enclosure. This switch was designed to meet the requirements of network systems.

Improvements in core and coil design of these network transformers result in excellent electrical performance. Cores are assembled using beveled and notched laminations sheared from cold-rolled oriented grain steel and individually annealed in a continuous roller hearth furnace to obtain extremely flat configuration.

Write U-709 on reply card, pg. 21

Utility pole wire mesh

A woven steel wire mesh designed to protect utility poles from woodpeckers is now available from the American Steel and Wire Div., Unit-

ed States Steel Corp., P. O. Box 599, Fairfield, Ala.

The new product is expected to greatly reduce the high toll of woodpecker-ruined utility poles in wooded sections of the South and other regions.

Write U-710 on reply card, pg. 21

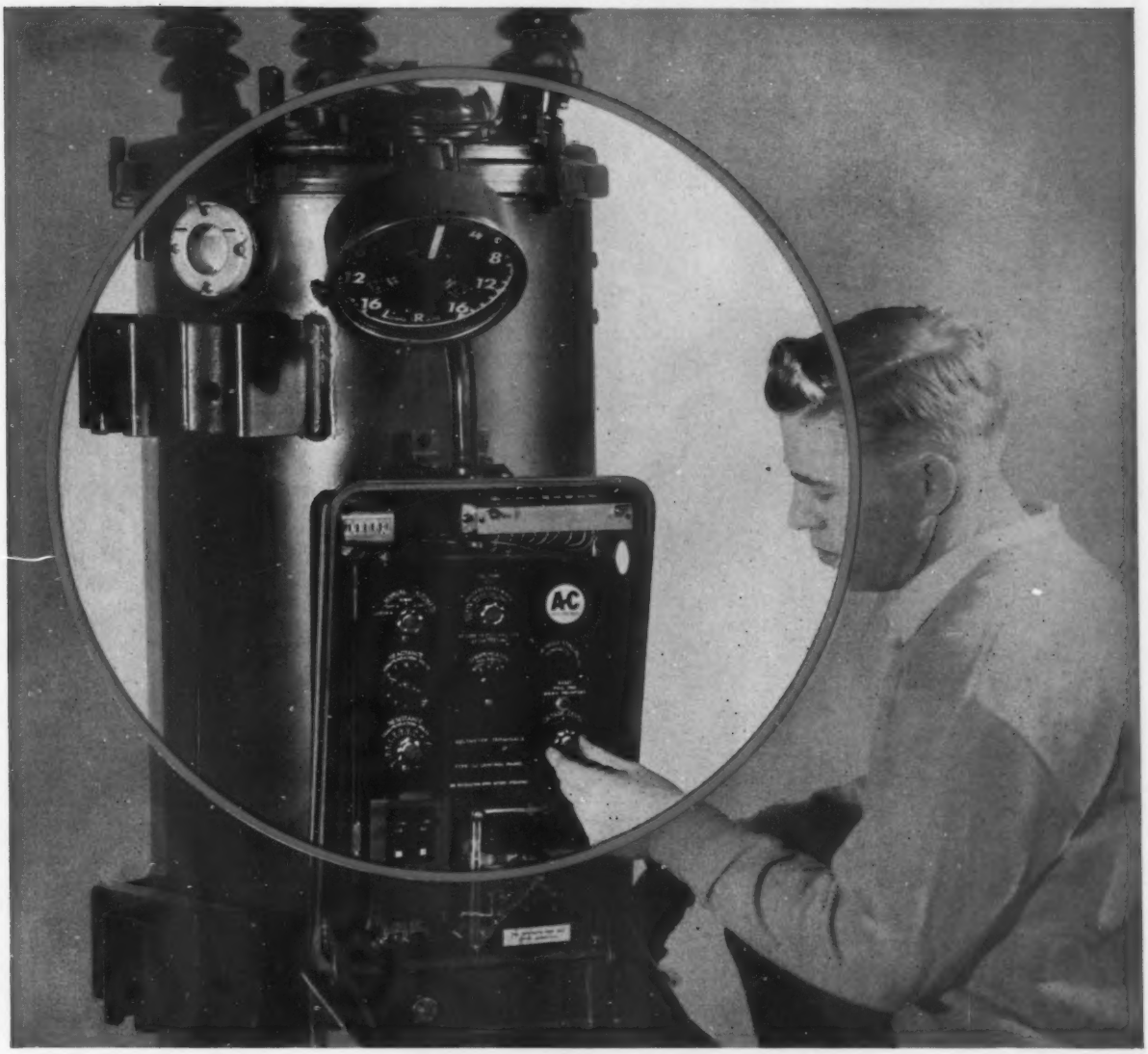
Anchor meter socket

A new 200-ampere "ringless" meter socket is now being manufactured by Anchor Manufacturing Co., P. O. Box 959, Manchester, N. H., a division of Basic Products Corp.

This "ringless" meter socket is available with a unique new type of lever-operated bypass in four-, five-, six-, or seven-jaw arrangements. This

ALLIS-CHALMERS

Originators of 5/8% Step Regulators



"Magic Circle" control center

Puts all JFR regulator indicators, controls at operator's fingertips!

Completely electrical adjustment with famous *Feather-Touch* control accurately sets narrow band widths and voltage levels.

Fingertip-adjustable *Caliband* control cuts setting time without changing customer voltage or compensator settings.

Electrically resettable position indicator drag hands eliminate pole climbing or "climber" damage!

Conveniently located oil sight gauge permits checking oil level at a glance.

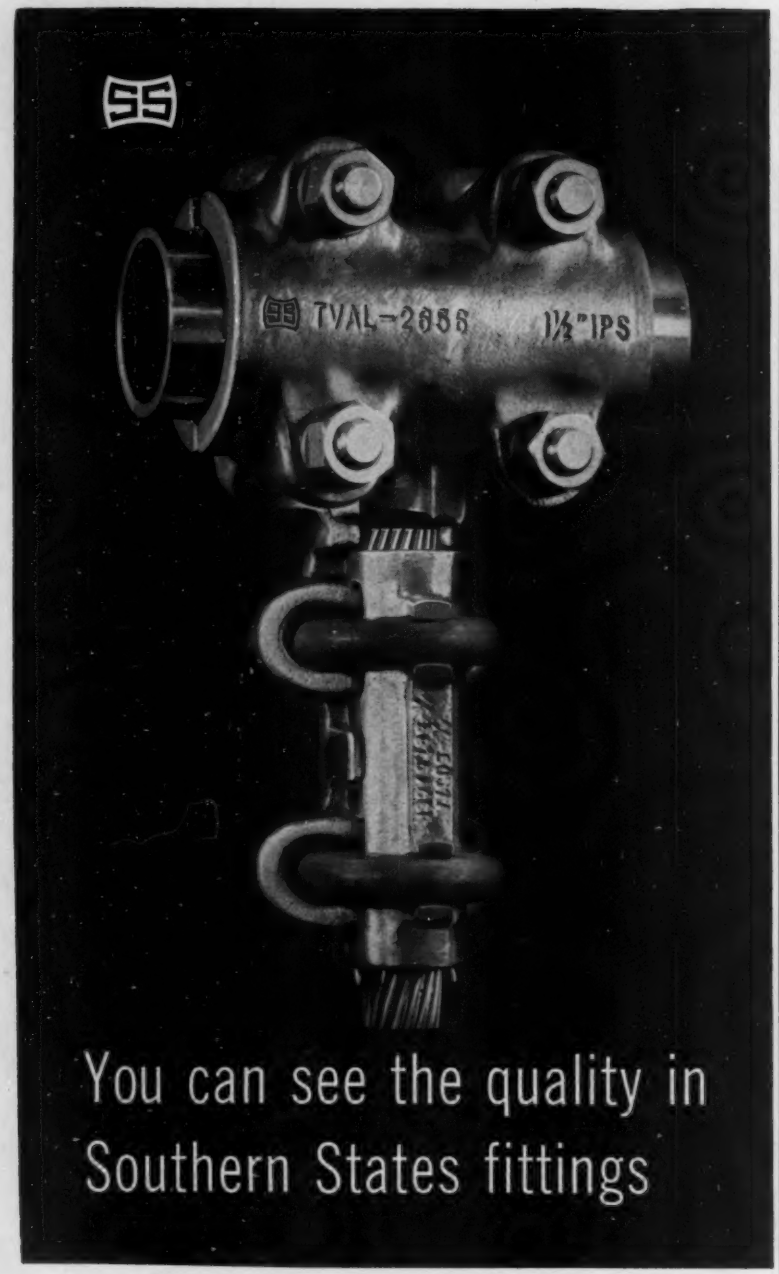
Six-digit counter records up to one million operations, simplifies record keeping and detects excessive operations.

Snap-action *Vari-Amp* control for positive settings.

Specify **Allis-Chalmers** *Regulators . . . call, wire or write your nearby A-C office.* A-1444

Feather-Touch, Vari-Amp and Caliband are Allis-Chalmers trademarks.

For more details on above items, use reply card on page 21



Engineers with an eye for good design know at a glance that Southern States fittings are top quality throughout. Made in our own plant from carefully chosen bronze or aluminum alloys, they provide maximum mechanical and electrical characteristics. Recessed boltheads permit one-wrench assembly. Never underestimate the importance of a good connection!

SOUTHERN STATES
EQUIPMENT CORP.
HAMPTON, GEORGIA

IN CANADA Dominion Cutout Co., Ltd., Toronto

socket line has terminals for 250 MCM maximum copper or aluminum cables and an enclosure of ample size for either top or bottom feed. After removal of the cover, a wire bail lever is exposed which, when pulled forward, bypasses the meter.

The wire bail lever is arranged so as to make it impossible to replace the cover without moving the lever to withdraw the bypass.

The new meter sockets are also available without the bypass feature, but all have means for grounding meter protective gaps.

Write U-711 on reply card, pg. 21

Southern States bus fittings

Southern States Equipment Corp., of Hampton, Ga., has developed a line of weld-type corona-suppressing electrical bus fittings.

One member of the new line, the expansion stud connector, is designed for corona-free operation up to 345

kv. Other arrangements are available for application at 460 kv.

Integral-shield design eliminates the need for external grading rings. The expansion unit features welded construction throughout. Recessed bolts mount the unit at the desired angle to the stud clamp.

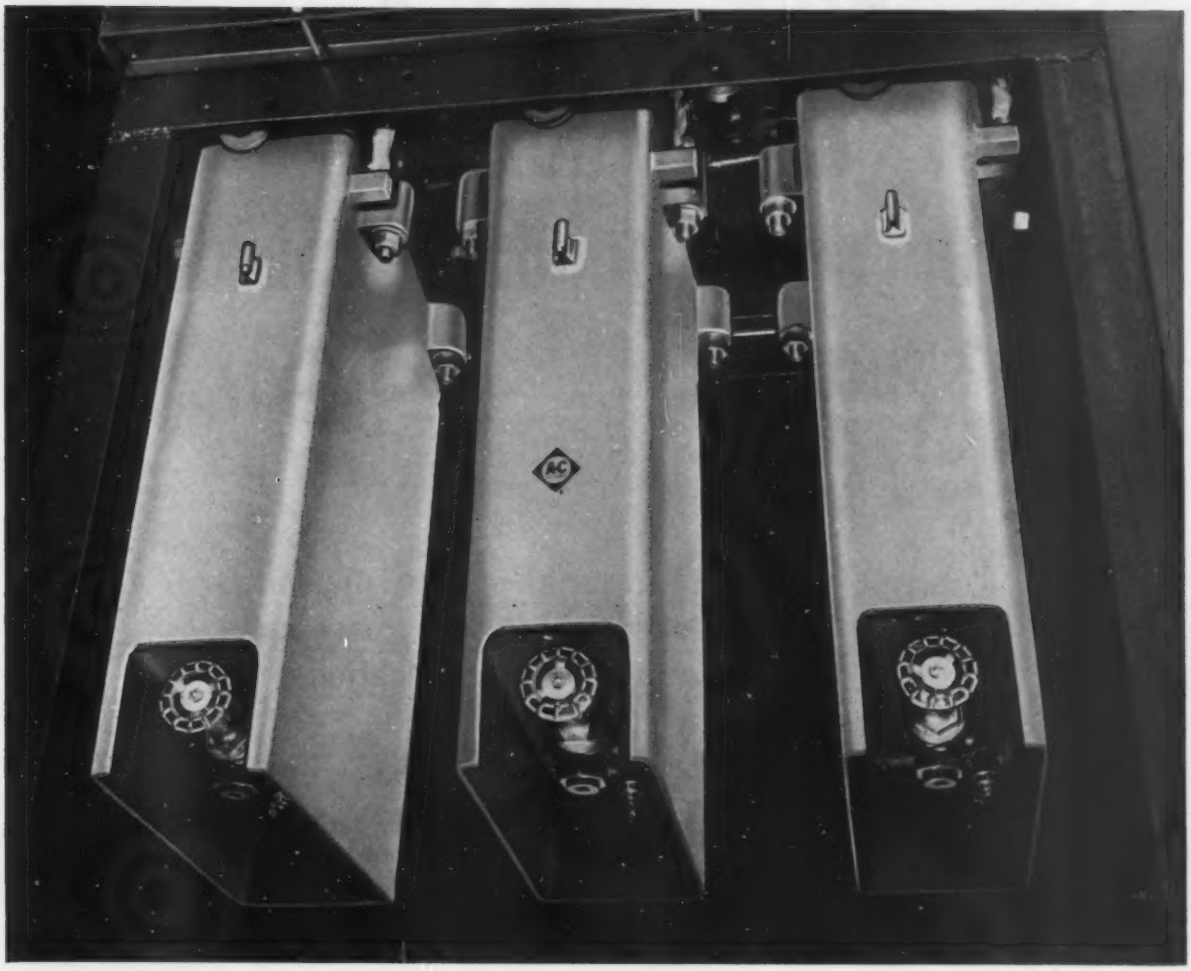
Write U-712 on reply card, pg. 21

Rome conductor insulation

A new conductor insulation material—possessing heat and abrasion resisting qualities hitherto unattainable—has been developed by Rome Cable Div., Aluminum Company of America.

Designated "Rome Poly-X," the

ALLIS-CHALMERS



Absolute phase isolation

...available on 14.4 and 23-kv outdoor distribution breakers!

Three-tank construction is a must for transmission circuit breakers to prevent phase-to-phase flashover. A-C gives you this same positive-protection, three-tank construction in 14.4 and 23-kv breakers.

Allis-Chalmers breaker protection extends even further! Each tank is lined with high dielectric insulation. Liners are nonbuckling, nonwarping.

Three-tank design cuts oil contamination and maintenance, since only the faulted phase is affected. And new Type LO cross-blast interrupters (250 and 500 mva) minimize oil contamination even further by reducing interrupting time to *5 cycles* over the *entire* range of interrupting currents (up to 25,000 amps).

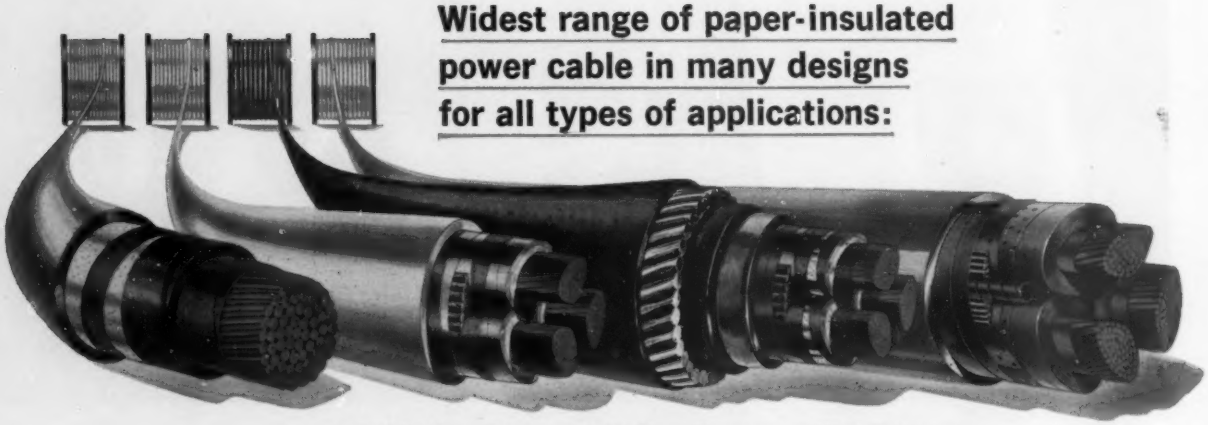
Type OZ breakers are available in 600 and 1200-ampere continuous-current ratings. Your nearby A-C office can give you full details, or request Bulletin 71B9705 from **Allis-Chalmers,** *Power Equipment Division, Milwaukee 1, Wisconsin.* A-1425

Two rugged, cross-blast interrupters per phase reduce arcing time to less than 5 cycles — sharply cut oil contamination.

For more details on above items, use reply card on page 21

For a complete line of Electric Cable from one dependable source... specify PHELPS DODGE!

Widest range of paper-insulated power cable in many designs for all types of applications:



● **Solid** ● **Low Pressure** ● **Medium Pressure** ● **High Pressure**

Phelps Dodge paper-insulated power cables have a demonstrated record of long life service in a great variety of designs for all kinds of installations—underground duct, direct burial, submarine and aerial. Cables can be supplied with lead or aluminum sheaths.

PHELPS DODGE COPPER PRODUCTS
CORPORATION
300 Park Avenue, New York 22, N. Y.

MINE TO MARKET

new material derives its properties from a unique polyethylene modifying process.

Boasting several times the abrasion resistance of conventional polyethylene, this new Alcoa product is particularly suitable for electrical conductor applications requiring a high degree of mechanical durability and toughness.

Recent tests show the new insulation to have virtually unlimited resistance to environmental stress and thermal cracking conditions—compared with the moderate resistance of polyethylene.

Providing insulation rating values up to 600 volts, this versatile new insulation has a damage threshold temperature in excess of 300 C, contrasted with conventional polyethylene, which softens at about 110 C. Rome Poly-X has sufficient ductility to permit bending at temperatures as low as -55 C.

Write U-713 on reply card, pg. 21

Bodendieck hot ammeter

A new hot ammeter has been recently introduced by Bodendieck Tool Co., Route 48 North, Taylorville, Ill.

This new tong-test device utilizes a fixed air gap on the magnetic pickup core to provide four per cent accuracy in the ranges 0 to 400, 0 to 100, and 0 to 40, on high and low voltage lines. The absence of moving parts on the pickup allows the instrument to retain its accuracy with a minimum of maintenance.

Special trigger sticks are not required for hot applications. The ammeter can be mounted on standard universal or adjustable type hot sticks.

Housing for the device is high impact phenolic designed for best visibility when used with a hot stick. Movement is high torque and is unaffected by electrostatic fields. Total weight of the ammeter is only 2½ pounds.

Write U-714 on reply card, pg. 21

Burndy entrance dead ends

Dead-ending services goes faster and easier with new Wejit side-entrance dead ends introduced by

We Welcome your Comparison

of the

DAVIS T-66

against all comers!

AS A TRENCHER...AS A BACKFILLER

Find out why owners from coast to coast, border to border and in many foreign countries, call it their "Best Money-Maker"!

The T-66 makes its owners more money because it does the complete job from initial cut to backfilling with greater efficiency than any two machines. A competitive demonstration will prove it. Extra-heavy, 1400-lb. weight, large track shoes, and a unique hydraulic drive combine for ground-gripping traction that gives accurate ditching control and backfilling power. No rubber-tire bounce! Hydraulic boom control makes you the "boss" of the digging depth and backfill blade. Agile backfilling maneuverability is attained by Instant Forward/Reverse. No trencher touches it in the range between **12" wide,** 30" deep and 4" wide, **66" deep.** It can also be equipped to dig **16" wide,** 24" deep — or **flush** alongside walls and fences. Built to handle toughest assignments. Produced by men who are leaders in the design of digging equipment.

the DAVIS HUSTLER UTILITY TRAILER

This 2000-lb. capacity, tilt-bed trailer for the T-66 and other loads has low center-of-gravity stability and load equalization suspension system. Sides optional.

the DAVIS PUP TRENCHER *Self-Propelled*

Digs by itself. This self-propelled trencher is driven by a six-speed winch mechanism. A productive tool for trenches 2"-3" wide to 36" deep, or 4" wide, 18" deep.

We Welcome Competitive Demonstrations!

See for yourself why the T-66 is the standard bearer of trencher value. Ask about its 90-day unconditional guarantee!

DAVIS MFG. INC.

1524 S. McLean Blvd., Wichita 13, Kan.

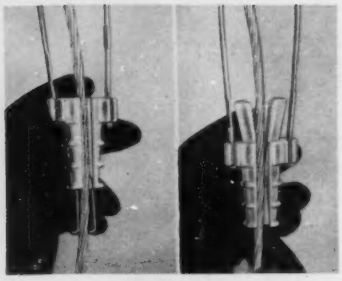
Please send me descriptive T-66 literature and the name of my DAVIS dealer____. I am also interested in the Davis Pup____ Davis Hustler____.

NAME _____

ADDRESS _____

TOWN _____ STATE _____

D3-261



Burndy Corp., Richards Ave., Norwalk, Conn., for cable sizes No. 6-No. 2 AAC and No. 6-No. 2 ACSR.

The new dead end can be attached at the house or pole in two simple steps, without threading the cable or disassembling the connector. First, the cable, at any distance from the end, is snapped into the jaws of the dead end. Then a short, quick pull on the cable makes the jaws grip it firmly.

Both jaws grip the cable for their full length. Because the jaws move in the dead end's tapered body groove, their grip tightens as the pull on the cable increases. Holding power has been tested up to 1,300 pounds, exceeding the pullout load on service drop cables.

Major parts are of aluminum and stainless steel, effectively resisting corrosion. They are unaffected by vibration and do not expand and lose their grip under severe freezing.

Write U-715 on reply card, pg. 21

Helpful literature

A new 12-page, two-color revision of descriptive bulletin 541 describing Positect **enclosed distribution cutouts** is now available free upon request from **S&C Electric Co.,** 4435 N. Ravenswood Ave., Chicago 40, Ill. The new bulletin contains completely revised interrupting ratings with asymmetrical and symmetrical values and associated curves. New switching information (with and without load interrupter attachment), cutaway working diagrams, and complete refusing instructions are also included.

Write B-716 on reply card, pg. 21

General Electric Co., 1 River Rd., Schenectady 5, N. Y., now offers bulletin GEA-7141, four pages, discussing the features, operation, application, and filtering process of G-E **oil filter presses** and Pyranol purifiers for reconditioning insulating liquids in transformers, regulators, and circuit breakers. The publication includes available ratings, components, prices, and data tables.

Write B-717 on reply card, pg. 21

Flexoplate **radiators** for transformer cooling are described completely in a four-page bulletin by **Tranter Manufacturing, Inc.,** Lansing 9, Mich. The bulletin outlines product features and advantages and gives complete dimensional and weight data, as well as heat transfer surface provided for a wide range of sizes and styles suitable for distribution transformer and small power transformer cooling.

Write B-718 on reply card, pg. 21

A booklet now available from the **Westinghouse Electric Corp.,** Lighting Div., Edgewater Park, Cleveland, Ohio, describes the company's new 750- and 1,000-watt mercury lamp **streetlighting luminaire,** type OV-50. The four-page publication, No. SA-8869, tells where the OV-50 should be applied, as well as some of the characteristics of the luminaire.

Write B-719 on reply card, pg. 21

Bulletin FC4, describing the company's type HXO **power fuse,** is available from **Line Material Industries,** McGraw-Edison Co., Milwaukee 1, Wis. Included in bulletin FC4 are descriptions, application information, features, and dimensional and ordering information. Also included are fuse link descriptions and time current characteristics.

Write B-720 on reply card, pg. 21

NOW! TOMIC'S NEW 707 Snap-On ALL PURPOSE FIXTURE CLIP

catalog no. 707

Hangs Fixtures To Suspended Ceilings

FASTER • BETTER
CUTS INSTALLATION COSTS 50% AND MORE

Pat. Pending

SCREW ⅜" PIPE into threaded hole.

SCREW ¼" ROD OR BOLT into threaded hole

To use ⅜" rod or bolt, insert ⅜" nut above threaded hole

Tomic's new SNAP-ON ALL PURPOSE FIXTURE CLIP is cleverly designed to use inexpensive 1½" lathing channel for mounting flush, surface or stem fixtures from the suspended ceiling framework. SNAP-ON FIXTURE CLIPS readily snap on the channel at any point—require no bolts or screws for attaching—can be adjusted from below even after the ceiling tile is in place.

1 SLIP — Slip threaded end of Snap-Ons over bottom of channel.

2 SNAP — Snap over top of channel

3 SCREW — Screw nipple or rod through Snap-Ons until it butts against channel. That's all.

ALL TOMIC FITTINGS ARE AVAILABLE THROUGH WHOLESALERS ONLY.

TOMIC ROMEX CABLE CONNECTOR

It takes only seconds to secure cables to junction boxes with Tomic Romex Cable Connectors. Just tip in the connector, slip cable through, tighten screws—and cables are securely, positively locked in place, without locknuts! Simplifies cable connecting . . . saves time and money on every cable installation job! (Also ideal for securing rubber cord.)

tomic
TODAY'S FINEST ELECTRICAL FITTINGS

TOMIC SALES & ENGINEERING CO.
20000 Sherwood Avenue
Detroit 34, Michigan

SUBMERSIBLE

15 kv G&W Oil-Fuse Cutouts

are full-rated for 110 kv BIL duty!

G&W Type FC72, 15 kv Oil-Fuse Cutouts have full 110 kv BIL and high interrupting ability for today's distribution circuits. Impulse withstand level is 110 kv under standard 1½ x 40 microsecond wave and 60-cycle one-minute withstand is 50 kv.

The Type FC72 Cutout can interrupt 7000 amperes asymmetrical (4200 amperes symmetrical) on single-phase operation at 13.8 kv, or 100,000 kva, symmetrical, on three-phase applications. Continuous-current rating is 200 amperes. It can break load currents up to 300 amperes where power factors are 50% or higher and can break magnetizing and load currents of 100 amperes at power factors of 20% or less. Metal-to-metal flanged surfaces with retained gaskets and a heavy wall dome area make this device applicable for use in hazardous locations.

The new G&W 15 kv Cutout is safe, simple to install, easy to operate, and is *completely submersible.* In-line construction with operating shaft running horizontally through the cutout dome makes possible coupling of gang-operated cutout shafts in a straight line. Operating handle rotates beyond dead center to lock both "On" and "Off" positions. The interrupter unit with fuses and replaceable switch contacts is raised into the dome above the oil when the cutout is switched to the "Off" position. They are accessible when dome is swung back on its hinge. Dome cannot be opened while switch is in the "On" position.

Repeated tests of the G&W Type FC72 Oil-Fuse Cutout show it will operate five times at full interrupting rating before inspection or replacement of oil is needed.

Contact your G&W representative for complete information, or send for Catalog CC.

G&W ELECTRIC SPECIALTY COMPANY

3524 WEST 127th STREET • BLUE ISLAND, ILLINOIS

CANADIAN MFR. • POWERLITE DEVICES LTD. • TORONTO, MONTREAL & VANCOUVER

C 60-2A

superior quality standards—inspired specialized design

For more details on above items, use reply card on page 21

New series of tables extended to include larger hourly rates

A NEW SERIES of estimating tables, completely revised in the light of more recent jobs and experience, are presented in this issue and will appear from month to month in forthcoming issues. These electrical estimating data sheets cover labor only and are arranged alphabetically with the basic material headings as a title for each tabulation.

Labor units given in these tabulations are based on a minimum of interference during work progress. The averages listed do not provide for abnormal job conditions, and any such abnormal conditions will require adjustments by the user, based on his experience.

The work units covered by each table are composed of one or more separate but closely related operations necessary for the complete installation of a particular basic item of electrical equipment. These operations associated with the basic material are described at the bottom of each table.

Most of the electrical estimating tabulations follow the same form. Column 1 at the left shows the size of the material to be installed. The second column from the left gives the time required to install the material, and it should be noted especially that this "productivity" column may be based on individual units or in the case of cable or conduit on units of 100 feet or 1,000 feet. The abbreviations "Ea." for each, "C" for hundreds, and "M" for thousands in Column 2 indicate the basis of the labor hours.

Columns 3 to 13, from the left, give the actual labor costs in dollars per unit of installation, at various hourly wage rates.

When calculations are being made for an hourly wage rate that doesn't correspond to any of the rates listed in Columns 3 to 13, the user may multiply the number of hours in Column 2 by 100 and this will give the labor cost based on an hourly wage rate of $1 per hour. By multiplying this by the hourly wage rate that actually applies in the user's locality, the exact labor cost of the operation may be obtained. Labor costs obtained in this way will be for units, hundreds of feet, etc., as given in heading of Column 2 of the table.

The labor units covered by the tables represent direct job labor costs and do not include delivery of material to site, engineering, estimating, or any other indirect cost.

As will be noted, some of the electrical estimating tabulations to be given will be for independent operations, such as excavating, backfilling, etc. These are included for use in preparing estimates on work of a special nature not covered under a specific table heading.

Tables will appear in alphabetical order.

FIBER CONDUIT BRIDGES 3" SPACING - PIPE (ADD AS REQUIRED)

CONDUIT SIZE	HOURS EACH	LABOR COST EACH INSTALLED AT FOLLOWING RATES										
		2.00	2.25	2.50	2.75	3.00	3.25	3.50	3.75	4.00	4.25	4.50
2"	.12	.24	.27	.30	.33	.36	.39	.42	.45	.48	.51	.54
3"	.17	.34	.383	.425	.468	.51	.55	.60	.64	.68	.72	.77
4"	.17	.34	.383	.425	.468	.51	.55	.60	.64	.68	.72	.77
4½"	.22	.44	.495	.55	.61	.66	.72	.77	.83	.88	.94	.99
5"	.28	.56	.63	.70	.77	.84	.91	.98	1.05	1.12	1.19	1.26
		3" SPACING - 3 PIPE BRIDGE (ADD AS REQUIRED)										
2"	.17	.34	.383	.425	.468	.51	.55	.60	.64	.68	.72	.77
3"	.17	.34	.383	.425	.468	.51	.55	.60	.64	.68	.72	.77
4"	.22	.44	.495	.55	.61	.66	.72	.77	.83	.88	.94	.99
4½"	.22	.44	.495	.55	.61	.66	.72	.77	.83	.88	.94	.99
5"	.28	.56	.63	.70	.77	.84	.91	.98	1.05	1.12	1.19	1.26
		4" SPACING - 4 PIPE BRIDGE (ADD AS REQUIRED)										
2"	.17	.34	.383	.425	.468	.51	.55	.60	.64	.68	.72	.77
3"	.22	.44	.495	.55	.61	.66	.72	.77	.83	.88	.94	.99
4"	.22	.44	.495	.55	.61	.66	.72	.77	.83	.88	.94	.99
4½"	.28	.56	.63	.70	.77	.84	.91	.98	1.05	1.12	1.19	1.26
5"	.28	.56	.63	.70	.77	.84	.91	.98	1.05	1.12	1.19	1.26

E-101-B

LABOR: Includes placing and tying in.

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THREADING RIGID CONDUIT
BY HAND

PIPE SIZE	HOURS EACH	LABOR COST INSTALLED EACH AT FOLLOWING RATES										
		2.00	2.25	2.50	2.75	3.00	3.25	3.50	3.75	4.00	4.25	4.50
1/2"	.09	.18	.203	.225	.248	.27	.293	.315	.338	.36	.382	.405
3/4"	.09	.18	.203	.225	.248	.27	.293	.315	.338	.36	.382	.405
1 "	.11	.22	.248	.275	.303	.33	.358	.385	.413	.44	.468	.495
1 1/4"	.13	.26	.293	.325	.358	.39	.423	.455	.488	.52	.55	.59
1 1/2"	.17	.34	.383	.425	.468	.51	.55	.60	.64	.68	.72	.77
2 "	.22	.44	.495	.55	.61	.66	.72	.77	.83	.88	.94	.99
2 1/2"	.22	.44	.495	.55	.61	.66	.72	.77	.83	.88	.94	.99
3 "	.28	.56	.63	.70	.77	.84	.91	.98	1.05	1.12	1.19	1.26
3 1/2"	.33	.66	.74	.83	.91	.99	1.07	1.16	1.24	1.32	1.40	1.49
4 "	.44	.88	.99	1.10	1.21	1.32	1.43	1.54	1.65	1.76	1.87	1.98

E-101-B

LABOR: Above figured on intermittant operations. Add 12 minutes to set up pipe vise and tooling as required. Time includes cutting, reaming and threading only.

7-61

Electrical Estimating—III

CONCEALED
NEW WORK

METALIC CONDUIT FLEXIBLE - WOOD RESIDENCES

CONDUIT SIZES	HOURS "C"	LABOR COST INSTALLED PER FT. AT FOLLOWING RATES										
		2.00	2.25	2.50	2.75	3.00	3.25	3.50	3.75	4.00	4.25	4.50
1/2"	4.6	.092	.104	.115	.127	.138	.15	.161	.173	.184	.196	.207
3/4"	5.5	.11	.124	.138	.151	.165	.179	.193	.206	.22	.234	.248
1 "	6.6	.132	.149	.165	.182	.198	.215	.231	.248	.264	.281	.297
1 1/4"	7.2	.144	.162	.18	.198	.216	.234	.252	.27	.288	.306	.324
1 1/2"	8.1	.162	.182	.203	.223	.243	.263	.284	.304	.324	.344	.365
2 "	9.7	.194	.218	.243	.267	.291	.315	.34	.364	.388	.412	.437
		BRICK RESIDENCES										
1/2"	5.2	.104	.117	.13	.143	.156	.169	.182	.195	.208	.221	.234
3/4"	6.0	.12	.135	.15	.165	.18	.195	.21	.225	.24	.255	.27
1 "	7.3	.146	.164	.183	.201	.219	.237	.256	.274	.292	.31	.329
1 1/4"	8.1	.162	.182	.203	.223	.243	.263	.284	.304	.324	.344	.365
1 1/2"	8.9	.178	.20	.223	.245	.267	.289	.312	.334	.356	.378	.401
2 "	10.8	.216	.243	.27	.297	.324	.351	.378	.405	.432	.459	.486

E-102-B

LABOR: Includes handling material at site, drilling access holes, cutting and installing flex, strapping attaching at terminus.

7-61

Electrical Estimating—III

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News of the industry

edited for Southern readers

Investment study shows utilities on solid ground

THE PATTERN OF PROGRESS shown by the electric utility industry since its beginning, and especially in recent years, will be repeated in the years ahead, says *The Value Line Investment Survey.*

Energy consumption is expected to keep on increasing at a faster rate than the general economy. Engineering and scientific skills will continue to accomplish breakthroughs in the improvement of generation and transmission efficiency, and the substitution of mechanical for human labor.

The newest generating plants, the survey continues, are 20 per cent more efficient than the present industry average. Improvements in transmission techniques have matched advances in the art of generating power, permitting development of a vast network of interchange grids across the nation. Formations of additional networks are in the offing.

Thus utility companies have the economic advantages of large generating stations and may reduce the amount of reserve capacity required by any one company.

The forthcoming Edison Electric Institute study on the extent and effectiveness of interconnection and the pooling of power sources will result, the survey expects, in enlargement and improvement of present arrangements.

Moreover, the survey concludes, such an outcome would further President Kennedy's power program. Then too, the findings of the report, when presented to Congress, might also help to contain those advocates of public power who propose a giant Federal grid.

Continued progress in the electric utility industry seems assured, but the survey cautions investors that even in terms of capital growth, electric utility stocks at current prices have lost much of their former allure.

Mississippi State holds annual school on meters

THE 11TH ANNUAL Electric Meter School will be held at Mississippi State University, July 24-28, 1961.

Primary subject matter covered by the school will be single-phase meters, demand and basic polyphase meters, and advanced techniques, with emphasis on the latest developments.

A special feature of the school will be the presentation of the university's meter correspondence course.

Sales organization studies new Arvin heating equipment

The Southeastern sales organization for Arvin Industries met in Atlanta recently to learn details of the new Arvin electric space heating equipment from Joe Freeland, sales manager, electric heating division. Standing, from left to right, are Mr. Freeland; Bucky Bryant, Atlanta, Arvin Southeastern regional sales manager; Ross Thomas, Memphis; Weithers Brooks, R. W. Chapman Co., Charlotte; Bill Evans, W. T. Evans and Assoc., Ft. Lauderdale; and Larry Chamblee, Patton-Gulf Sales Agency, New Orleans. Seated, from left to right, are Bob Chapman, R. W. Chapman Co.; Cullen Adams, Atlanta; Len Boyles, W. T. Evans Assoc.; and Dick Davis, R. W. Chapman Co.

Tampa utility sponsors annual lighting school

RECORD-BREAKING crowds attended Tampa's sixth annual lighting school, which was held recently at the Greater Tampa Chamber of Commerce auditorium.

More than 260 persons registered for the classes conducted over a six-week period by the Lighting Dept., Tampa Electric Co.; the Florida Section, Illuminating Engineering Society; and the Tampa Chapter, Florida Association of Electrical Contractors.

Average attendance numbered 131 persons, and after satisfactorily completing the course, 111 graduates received diplomas from M. T. Anthony, vice-president of sales, Tampa Electric Co.

The school, one of the largest of its kind in the country, attracted people of electrical and related professions from the entire central-west coast area of Florida. Guest speakers this year included some of the country's outstanding leaders in the lighting profession.

Among the speakers were George J. Taylor, vice-president, Day-Brite Lighting, Inc., St. Louis, Mo.; Miss Jan Reynolds, home lighting specialist, Sylvania Co., New York; E. C. Pauly, manager, General Electric Ballast Dept., Danville, Ill.; E. K. Becker, sales engineer, Superior Electric Co., Bristol, Conn.; W. J. Pettyjohn, regional lighting sales

Yard lights using photoelectric cells were substituted for conventional street lights in the Campus Park development opened recently in the Tampa area.

manager, Westinghouse Co., Atlanta; R. V. Ridenhour, district engineer, General Electric Lamp Div., Tampa; M. H. Gray, president, Fluorescent Service, Inc., Tampa; R. R. Minton, consulting engineer, Tampa; and Joseph R. Ray, vice-president and general sales manager, Curtis-Allbrite Lighting, Inc., Chicago, Ill.

The well-rounded program covered a wide range of lighting subjects, such as "Let's Sell the Benefits of Good Lighting—Together!," "The Essence of Lighting," "Solutions and Seeing Systems for Offices and Stores," "The Past—the Present—the Future—of Fluorescent Lamp Ballasts," "Lighting Control," "New Light Sources for New Light Levels," "Footcandles and Horse Sense," and "Now We Know It—Let's All Sell It."

Ceilheat elects Goff as company president

JAMES ED GOFF has been elected president of Ceilheat, Inc., Knoxville, Tenn., it was announced recently.

Henry T. Harris has become chairman of the board of directors and continues as treasurer of the company; L. O. Ledford has been elected a vice-president; Robert G. Ely, Jr., vice-president-secretary and general sales manager; and Jack Witherspoon, Jr., vice-president—engineering.

Swivelier selects agents for two Southern areas

SWIVELIER CO., INC., of New York, has announced the appointment of Finney-Irvin Associates as their representative in the Nashville area and of Thomas A. Marshall & Associates as representatives in southern Florida.

Builders promote sales with street illumination

PROMOTIONS BUILT around street lighting are being used by two Tampa, Fla., builders in selling homes.

Builders of a new Town 'n Country Park development of some 3,500 homes recently signed a contract for street lighting of the entire development. Though many builders provide main thoroughfare lighting, this is the first entire project to be taken over in the Tampa Electric Company area.

Campus Park, another new development, had other problems. Since all of the easements are at the rear of the houses, the installation of special poles and wiring for street lighting would have been expensive. The builders decided to install yard lights with photoelectric cells in front of each house in the development, thus providing both street and pedestrian lighting.

This also solved the problems of street light tax districts, signing contracts, etc. In addition, the yard lights will provide extra residential revenue in this totally electric subdivision.

IES group to present fourth lighting show

THE FOURTH ANNUAL lighting exposition sponsored by the North Texas section, IES, will be held November 3, 1961, in the Commercial Exhibits Building of the Will Rogers Memorial Buildings, 3401 W. Lancaster Ave., Ft. Worth.

Concurrent with the exposition will be a lighting symposium and a demonstration or presentation by a prominent speaker, which will follow the theme of the exposition.

Reservations for booth space or additional information about the exposition may be obtained by writing to William F. Owens, Jr., Chairman, Lighting Exposition, 7160 Baker Blvd., Fort Worth 11, Texas.

Those invited to exhibit include section IES members, electrical distributors, architects and associates, electrical contractors, building and plant superintendents, electrical engineers, public utilities, school personnel, and governmental personnel and engineers.

Exhibitors will include sustaining lighting fixture manufacturers or fixture manufacturers represented by local IES members.

Sierra acquires rights for low-voltage system

PURCHASE BY SIERRA Electric Corp., Gardena, Calif., of all rights, inventories, and tooling for the low-voltage electrical control system currently produced by the Square D Company has been announced by Lee T. Bordner, Sierra's president.

The transaction, for an undisclosed amount of cash, adds materially to the rapidly expanding Sierra line of electrical wiring and control devices for residential, commercial, and institutional application.

According to Square D officials, the sale of the low-voltage control line conforms with a decision to direct development and sales efforts to products more closely allied with industrial control and distribution equipment.

All engineering manufacturing equipment for the low-voltage control system will be moved from the Square D facility at Cedar Rapids, Iowa, to the Sierra factory at Gardena, Calif., as rapidly as possible.

Chance reduces prices for two product lines

A CHANGE IN THE company's price structure of pole line hardware, brought about through a re-evaluation of prices following consolidation of manufacturing facilities at its Centralia plant, has recently been announced by A. B. Chance Co.

Included in the changes, announced by L. C. Hansen, Chance vice-president and general manager, is product line simplification, which will remove from the published price sheet those seldom used products which have appeared on this sheet for a number of years.

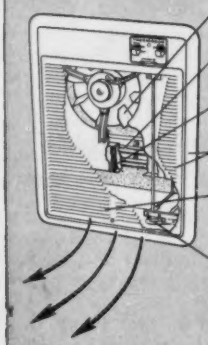
A re-evaluation of the zone No. 1 prizes, based on real costs, will be made. This involves an average price reduction of five to seven per cent.

Also in the program will come elimination of zones No. 2 and No. 3, so that all pricing east of the Rocky Mountains will be on the zone No. 1 basis, thus reducing prices in zones No. 2 and No. 3.

THERMADOR

"Seven Leagues Ahead" in the science of electric heating

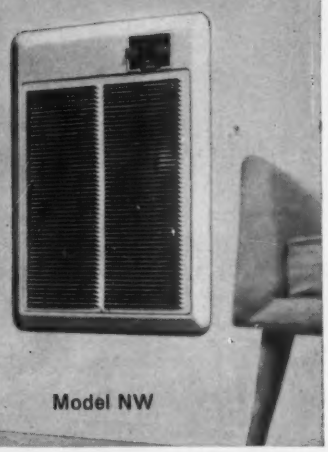
Most Efficient Heating!



1. Silent turbo-blade fan
2. Nichrome heating element
3. Fiberglas insulation
4. Flush-to-wall safety grille
5. Down-draft discharge "Heats the Living Zone"
6. Heavy-duty micro-switch thermostat

Master Duty Model NW
—the fastest "living zone" heater

Most Modern Design!



Model NW

THERMADOR

Bilt-in Electric Heaters

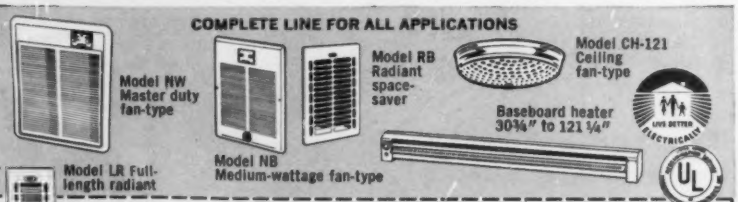
Millions in Use

Master Duty Fan-type Model NW (shown above) is designed for flush-to-wall installation between standard 16″ O. C. studding, without extra framing. Quiet, powerful turbo-blade fan directs heated air downward, to circulate thru the "Living Zone" of the room. No waste concentration of heated air at the ceiling.

Thermador Model NW has the *greatest heat speed of any heater.* Fast-heating nichrome wire—no heavy castings to pre-heat. Element recessed for safety. Residual heat expelled so efficiently, heater is UL approved for top wiring. Convenient top switches, neon indicator light, and safety thermo-cutout. Manual or thermostat models. Serves as an air-circulator in summer.

Spanish Gold baked enamel finish, or can be painted to match decor. 2000 to 4500 watts output, 240 volts A.C. From 6824 to 15,354 BTU's per hour. Overall grille size: 21″ high x 16¾″ wide. Projects 15/16″ from wall to edge of louver.

COMPLETE LINE FOR ALL APPLICATIONS



Originator of the Fan-Type Bilt-in Electric Heater

THERMADOR Electrical Manufacturing Co.

Division of Norris-Thermador Corporation

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Please send me illustrated literature on Thermador Electric Heaters.

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No change is being made in the price on Western zones No. 4 and No. 5 at this time, though they are under study.

In addition to the above changes, a price reduction on the major portion of the anchor line of from ten to 15 per cent is also being made in both Eastern and Western regions.

Texas convention set on power distribution

THIS YEAR'S annual Power Distribution Conference, sponsored by the University of Texas Department of Electrical Engineering, is to be held October 30 through November 1, it was announced recently.

This is the 14th such conference held by the university.

Circle F names agents for Kentucky and Ohio

THE PRESSLER-WEISSINGER Company has been newly appointed to handle distributor sales of the Circle F Manufacturing Company in Boone, Campbell, and Kenton Counties of Kentucky.

Agents with the Pressler-Weissinger Co., who will also cover Ohio, are Roy Pressler, with headquarters at 21724 Lorain Rd., Cleveland 26, Ohio; and Jack Weissinger, 1105 Jefferson St., Toledo 2, Ohio.

New Orleans utility promotes C. Sinnott

CHARLES J. SINNOTT was named a vice-president of New Orleans Public Service, Inc., at a recent board meeting of the utility.

He is also general sales manager of the company.

Officers of the company who were re-elected at the meeting include George S. Dinwiddie, chairman of the board; Gerald L. Andrus, president; Clayton L. Nairne, executive vice-president; and vice-presidents L. J. Cucullu, J. Mason Guillory, Paul F. Hoots, Floyd W. Lewis, and E. S. Myers.

Charles J. Sinnott

Also re-elected were Francis J. Labanca, comptroller; E. T. Colton, secretary and treasurer; and John E. Hevron and Victor Lota, each assistant secretary and assistant treasurer.

Mr. Sinnott attended Tulane University before starting with Public Service in 1937 as a commercial sales representative. After serving in other positions, he was appointed general sales manager in 1958.

NAED commends use of liability insurance

THE FOLLOWING STATEMENT, commending the use of liability insurance in the electric industry, was issued by the National Association of Electrical Distributors at the closing session of its recent 53rd annual convention held in Detroit.

"Products liability insurance—and the need for each electrical distributor to protect his company against claims arising out of the use of products they distribute — has been discussed at great length at recent NAED regional meetings.

"It was noted then that practically every major manufacturer of electrical products does carry product liability insurance for his own protection.

"It was further noted that many manufacturers extend coverage in their insurance policies to include protection of their own distributors as well. This is what is known in insurance as the vendor-vendee clause.

"In the recent past, a number of manufacturers have investigated their existing product liability program and, where it was found that their policy did not extend coverage to their distributors, they made the necessary arrangements to include this vendor-vendee clause in their product liability policy.

"The National Association of Electrical Distributors commends these manufacturers and sincerely hopes that all manufacturers will similarly investigate their existing products liability insurance coverage to determine if the vendor-vendee clause is a part of their insurance policy."

Dates ahead

Electric Meter School, Mississippi State University, State College, Miss., July 24-28, 1961.

NECA, Carolinas' Chapter All-Industry Meeting, Grove Park Inn, Asheville, N. C., July 26-28, 1961.

Edison Electric Institute, Public Utilities Association of the Virginias, White Sulphur Springs, W. Va., Sept. 14-16, 1961.

AIEE Petroleum Industry Conference, Jung Hotel, New Orleans, La., Sept. 17-20, 1961.

Edison Electric Institute IIFEUC Eighth Annual National Electric Farm Power Conference, Leamington Hotel, Minneapolis, Minn., Sept. 20-22, 1961.

IES National Technical Conference, Chase Park Plaza Hotel, St. Louis, Mo., Sept. 24-29, 1961.

National Rural Electric Cooperative Association, Region III, Admiral Semmes Hotel, Mobile, Ala., Sept. 25-26, 1961.

Old Dominion Industrial Exposition, Inc., Statewide Industrial Exposition, "Index," Roanoke, Va., Sept. 27-30, 1961.

National Rural Electric Cooperative Association, Region I, John Marshall Hotel, Richmond, Va., Sept. 28-29, 1961.

National Electrical Contractors Assn., Annual Convention and Exposition, Sheraton Park Hotel, Washington, D. C., Oct. 9-12, 1961.

National Rural Electric Cooperative Association, Region X, Cortez Hotel, El Paso, Texas, Oct. 12-13, 1961.

AIEE Fall General Meeting, Statler-Hilton Hotel, Detroit, Mich., Oct. 15-20, 1961.

IAEI, Southern Section, Grove Park Inn, Asheville, N. C., Oct. 16-18, 1961.

National Rural Electric Cooperative Association, Region II, Golden Gate Hotel, Miami Beach, Fla., Oct. 30-31, 1961.

Fourteenth Annual Power Distribution Conference, University of Texas, Austin, Texas, Oct. 30-Nov. 1, 1961.

National Rural Electric Cooperative Association, Region VIII, Jung Hotel, New Orleans, La., Nov. 2-3, 1961.

AIEE Winter General Meeting and Electrical Engineering Exposition, New York Coliseum, Jan. 29-Feb. 2, 1962.

Sixth National Electrical Industries Show, New York Coliseum, March 11-14, 1962.

National Electric Comfort Heating Exposition and Symposium, Sherman Hotel, Chicago, Ill., March 19-21, 1962.

English Electric forms new corporation in U.S.

THE ENGLISH ELECTRIC Corporation has been incorporated in the state of Delaware as a wholly-owned subsidiary of the English Electric Co., Ltd., of London, England.

The new corporation consolidates the U. S. activities of the English Electric Export and Trading Co., Marconi's Wireless Telegraph Co., Marconi Instruments, and the English Electric Valve Co., all of which have been represented in this country for ten years or more.

President of the corporation is E. S. Dean, who has been English Electric's group representative in the U. S. since 1949. The executive vice-president is Alan Barraclough, who has headed the English Electric Export and Trading Company in the states since 1952.

AIEE members favor engineering exhibits

SHOULD A TECHNICAL meeting of electrical engineers have its sessions supplemented by engineering exhibits of electrical and electronic products and services?

More than 70 per cent of the members of the American Institute of Electrical Engineers who recently were asked this question replied with a resounding—"definitely yes!"

As a result, the first industry-wide Electrical Engineering Exposition will be held in the New York Coliseum, January 29 through February 2, 1962. The week-long event will be sponsored by the American Institute of Electrical Engineers and will be held in conjunction with the technical sessions of the AIEE Winter General Meeting.

The AIEE membership survey that brought about the creation of the nation's first Electrical Engineering Exposition was conducted by the marketing research firm of John T. Fosdick Associates. The survey also showed that more than 43 per cent of the electrical and electronics engineers interviewed said they have not attended any exhibit in the past year or more and welcome one of their own.

N. S. Hibshman, executive secretary of the AIEE, who pointed out he was not too surprised by the results of the survey, said he believed there was "good reason for the strong desire to see an exhibit of the industry's products and services."

"Our 55,000 members and 117 affiliated local groups," Mr. Hibshman said, "have long known the value of the AIEE technical sessions. So, again, at the 1962 Winter General Meeting, we will have a large turnout for our technical program.

"Our members realize that in the fast moving technology, communications today receive a valuable assist from visualization. Our engineers would like to see the machines, the devices, and the varied products and services they hear about during the technical meetings."

Two entire floors of the New York Coliseum have been reserved for the exposition and meeting so that technical sessions will be held in meeting rooms adjacent to the exhibit areas, thus facilitating extensive viewing of exhibits.

H. F. Grebe, exhibits manager of the Reber-Friel Company of Philadelphia, nationally known exposition management concern in charge of the exposition, said that space is being assigned on a "first-come, first-served" basis.

Detailed information about the Electrical Engineering Exposition, floor plans of the exhibit areas in the New York Coliseum, exposition regulations, and applications for space may be obtained from the Reber-Friel Co., 117 S. 17th St., Philadelphia 3, Pa.

General Electric's Chamblee plant, near Atlanta, has become the production headquarters for the company's full line of switchboards and panels.

General Electric adds new wing at Chamblee

GENERAL ELECTRIC'S switchgear manufacturing plant in Chamblee, Ga., has tripled its employment and increased its production area 25 per cent since it began operations just under three years ago.

The expansion program was announced by William A. Armstrong, plant operations manager, and Forrest E. Baker, general manager of the G-E Medium Voltage Switchgear Dept., Philadelphia, Pa.

A new 10,000-square-foot wing, built and equipped for steel-fabrication operations, has just been completed. It boosts the plant's manufacturing area to a total of 50,000 square feet.

NEW Prismatic wrap around

23 FEATURES cut installation cost

1. Die formed. 2. Not less than 20 gauge, prime, cold rolled steel. 3. ELECTROSTATICALLY painted. 4. HPF ballasts, U.L. listed, E.T.L. and C.B.M. approved. 5. Two and four lamp models. 6. Rows, flush or pendant installation. 7 Extremely shallow, 8 indented endplates for light-seal. 9 Lamp and reflector location provide high efficiency illumination the E. T. L. reports; 10 low brightness, 11 even light distribution, 12 no shadows, 13 no visible lamplines. 14 Slide-out lamp holders and 15 fused circuit. 16 Ventilated snap-in cover provides; 17 longer ballast life, 18 eliminates vibration hum, 19 removes without tools for faster installation, 20 diffuser, extruded polystyrene with optical properties the E. T. L. reports, 21 one-piece wrap-around 22 locks in to prevent accidental fall-out 23 deluxe appearance at low cost.

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Excerpt from Electrical Contractor's unsolicited report . . . Letter of 4/10/61

. . . Our workmen advise that never have they installed any fixtures with so many features to aid them in installation; and we, needless to say, are happy to hear of advantages like this that can affect our cost.

Sincerely,

Clarence Grimm Electric Co., Inc.

H. W. Jasper, Estimating Eng.

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News about people

J. K. (Pat) Flanagan, vice-president in charge of public relations for Florida Power Corporation and a widely known utility figure, died in Miami on June 2, following a heart attack.

A resident of St. Petersburg, he was in Miami on a business trip, and was to attend a meeting of the Edison Electric Exchange in New York before returning to St. Petersburg.

He was born in 1902, and attended American Business College, New York City. After a varied newspaper career, during which he was in charge of many promotional campaigns in

J. K. Flanagan

the North, he came to St. Petersburg, where he joined the *Times* in 1934. In 1941 he became manager of a *Times*-owned radio station.

In 1942 he was named advertising director for Florida Power, and in 1957 was promoted to a vice-presidency and placed in charge of public relations.

Mr. Flanagan was a member of numerous civic organizations and did extensive work with philanthropic projects.

During his tenure of service with Florida Power he handled the public relations for a pageant which took oranges and bathing beauties to New York to sell investment bankers on Florida, and a tour which brought 100 investment bankers to Florida for a visit to tourist attractions and Florida Power properties.

A well-known non-commercial religious signboard in St. Petersburg was his idea, as was a "Hi, Neighbor" campaign which eventually became a statewide courtesy week.

L. M. Shadgett, vice-president and Athens, Ga., division manager for the Georgia Power Co., since 1937, has been named the company's vice-president and assistant general manager, with offices in Atlanta.

Ben W. Burton, Athens division superintendent since 1952, succeeds Mr. Shadgett as vice-president and Athens division manager. **John J. McDonough,** president, made the announcement.

A native of Adelaide, Australia, Mr. Shadgett is a graduate of the School of Mines of the University of Adelaide. He began work with Alabama Power Company in 1924, and joined Georgia Power in 1928. He has been a vice-president since 1940.

Mr. Burton, a native of Lavonia, Ga., received a BS degree in electrical engineering from Georgia Tech. He joined Georgia Power permanently as a field engineer in Atlanta in 1937. He has worked as district engineer and superintendent and assistant division superintendent and was stationed at Columbus, Albany, and Augusta prior to his new position.

Special Products Company of Tennessee, Inc., has announced the appointment of **George T. Wood** as general sales manager.

He is in charge of all sales and marketing activities of residential lighting fixtures under the trade name DeLights and fireplace furnishings under the trade name Royal. The general sales offices and company headquarters are located in Chattanooga, Tenn.

Before coming with Special Products, Mr. Wood was marketing vice-president for Smithcraft Corp. He has been regional sales manager for Lewyt Corporation in the Midwest and Southeast.

Prior to this he was with Graybar Electric Co., holding sales management positions in Atlanta, Tampa, and Jacksonville.

He is a graduate of Washington and Lee University.

George T. Wood

Wilfred L. Brown has been appointed manager of distributor sales for the Okonite Co., wire and cable manufacturing subsidiary of Kennecott Copper Corp., located in Passaic, N. J.

Since joining Okonite in 1956, Mr. Brown has served successively as manager of product advertising and assistant to the general sales manager.

Mr. Brown has been charged with the responsibility of building up Okonite's distribution outlets for rubber and plastic cables and tape products.

Rear Admiral **Rawson Bennett** (USN Ret.), formerly Chief of Naval Research, has been elected a senior vice-president of Sangamo Electric Company and appointed the company's director of engineering, it was announced by **C. H. Lanphier,** president.

Admiral Bennett, Chief of Naval Research for five years before his retirement from the service a few months ago, has had a prominent career in Naval engineering and electronics.

During World War II as head of the Electronics Design Division of the Bureau of Ships, Admiral Bennett was responsible for the design of electronics equipment for the entire Navy. He was the principal liaison officer to the Office of Scientific Research and Development. In 1939, he personally designed the first combined sonar team trainer for ASW and submarine teams.

He received an MS degree in electrical engineering from the University of California in 1937 and a BS degree from the U. S. Naval Academy in 1927.

Among his service decorations was the Legion of Merit in World War II for work which included design of sonic and supersonic underwater sound apparatus. He received a second Legion of Merit in 1961 for outstanding work as Chief of Naval Research.

Hans R. Wallrath has been named manager of construction industry sales for the General Electric Co., according to an announcement by **C. B. Elledge,** manager of the industrial sales and engineering operation.

In his new position, Mr. Wallrath will direct the sales of General Electric products and systems to such market areas as building construction, heavy engineered construction, and water, sewage, and defense construction projects. He also will be responsible for the development of national sales policies and procedures for the company in this market area.

A native of Dresden, Germany, he joined the company's engineering test course in 1929, following his graduation from the Institute of Technology, Dresden, with a degree in electrical engineering.

In 1952, he was appointed sales manager for contractor and construction industries for the Apparatus Sales Div., a position he has held until his recent appointment.

A. G. Steinmayer, vice-president, Line Material Industries, retired May 1, after 38 years of service to the company.

His 170 patents on electrical distribution and transmission equipment testify to his creative ability and engineering leadership. Fewer than one per cent of the nation's inventors have equalled his record in patents held.

Mr. Steinmayer started with L-M

A. G. Steinmayer

in 1923 as head of the engineering department and in 1935 he became the company's first research and engineering vice-president. He held this position until 1959 when he was named administrative vice-president.

One of his most important contributions to the electrical industry was his co-invention of the first successful dropout fuse cutout, which protects power lines against overload and short-circuit currents.

The appointment of **John C. Woodle** as vice-president of sales for Keystone Manufacturing Company was announced recently by **Robert L. Chandler,** president of the firm.

Mr. Woodle was formerly OEM sales manager for Keystone. Prior to

John C. Woodle

his assignment at Keystone, he was associated with Square D Company for 12 years. He holds an electrical engineering degree from Georgia Institute of Technology.

In his new post, Mr. Woodle will be responsible for directing all sales and advertising activities at Keystone headquarters and national and foreign sales. He will maintain headquarters at the company's offices, 23328 Sherwood Rd., Warren, Mich.

Precision Transformer Corp., Elk Grove Village, Ill., has announced the appointment of **Garry F. Simmons** as chief engineer.

His duties will include that of directing and supervising transformer engineering as well as research and development functions.

Mr. Simmons is an electrical engineering graduate of North Carolina State College. He has had extensive experience working on test programs for such products as transformer motors, switchgear, etc., and in research, development, and design of dry type transformers.

The board of directors of Hubbard and Company has announced the election of **John C. Monday** as vice-president and general manager of the Hapco Div., Pittsburgh, Pa.

Prior to joining the Hubbard organization in July of 1959, Mr. Monday was manager, Regulator Div.,

John C. Monday

Hevi-Duty Electrical Co., Milwaukee, Wis., where he had responsibility for sales, engineering, and research for airport and street lighting, and industrial power equipment.

He holds a BS degree in business and engineering administration from the Massachusetts Institute of Technology, and an MBA degree from the University of Wisconsin.

The appointment of **Robert L. Mercure** as a new Georgia representative of Champion Lamp Works has been recently announced by **Ray Monroe** of that company's sales department.

Mr. Mercure, whose home is 801 W. Rugby Ave., College Park, Ga.,

Robert L. Mercure

received his formal education at Georgia Military Academy and Auburn University.

He has had business experience as a factory representative selling to hardware distributors and as an owner of a distributor business.

Two new sales appointments have been made by Progress Manufacturing Co.

Sam Humphrey has been named regional manager for the Southwest, including Texas, Kansas, Nebraska, and Oklahoma. Serving as a representative in his territory will be **Clay Hathcock,** who will cover the northeast Texas and Oklahoma areas.

Mr. Humphrey has been associated with the company for six years, and resides at 406 Nottingham Dr., Richardson, Texas, with headquarters in Dallas.

Mr. Hathcock, whose home is in Dallas, recently spent 12 years in Saudi-Arabia handling procurement for the construction division of Arabian American Oil Co.

Rockbestos Wire & Cable Co., a division of Cerro Corp., New Haven, Conn., has announced the appointment of **Edward J. Parker** as sales manager of their Southeastern district, with headquarters to be established in Birmingham, Ala.

Except for a short period of time, Mr. Parker has been associated with Rockbestos as sales manager of their St. Louis district. He is a graduate of the Merchant Marine Academy in Kingsport, Long Island, N. Y.

Edward J. Parker

Technical books

for the electrical man

Tensor analysis

"Tensor Analysis of Electric Circuits and Machines," by L. V. Bewley. Published by the Ronald Press Co., 15 E. 26th St., New York 10, N. Y., 375 pages, 106 illustrations, $12.00.

This concise book offers a systematic introduction to the principles and applications of matrix-tensor methods of analysis in electrical engineering.

Three major areas are covered by the book: (1) the essentials of matrix theory, with applications to circuits and networks; (2) a brief development of the mathematical theory of tensor analysis; and (3) the application of tensor analysis in developing equations of the generalized electric machine, with transformations to all known machines as special cases.

Four different approaches are used in the book to present a unified and consistent theory of machines. These include physical considerations, Lagrangian equations, Maxwell's equations, and the Maxwell-Lorentz equations. The general solutions in different forms are reconciled and shown to be completely equivalent.

The author shows the versatility and generality of the tensor method as developed over the past quarter-century by Gabriel Kron, showing that complex networks and complicated combinations can be handled in a straightforward, systematic, and almost routine fashion.

The author was research and development engineer with the General Electric Company for 18 years. Since 1940, he has been a member of the faculty of Lehigh University, where he is now professor of electrical engineering.

Mr. Bewley is author of a number of other books and articles on electrical engineering subjects.

Transistor service

"Practical Transistor Servicing," by William C. Caldwell, service engineer and technical writer for Delco Radio. Published by Howard W. Sams and Co., Inc., 1720 E. 38th St., Indianapolis 6, Ind., 192 pages, $2.95.

One whole chapter of this book is devoted to the case history method of troubleshooting auto and portable transistor radios. The procedures were tested on hundreds of radios, and taught to thousands of student technicians.

Realizing that technicians (and even some engineers) need not know all the complicated transistor theory, the author has avoided such details as tracking holes and molecular structures. Instead, he devotes separate chapters to how the transistor works, circuit components and their functions, isolating trouble to a stage, normal transistor voltage, defective voltages and their meanings, testing transistors, and troubleshooting auto radios.

Agent directory

"1961 Verified Directory of Manufacturers' Representatives." Published by the Manufacturers' Agent Publishing Co., 554 Fifth Ave., New York 36, N. Y., 217 pages, $20.00.

This third edition is a revision of the directory published two years ago. Listed are more than 15,000 manufacturers' domestic and export representatives in the United States, Canada, and Puerto Rico.

The listings of representatives are arranged geographically and include the principal products each representative carries, plus the trading area covered.

In addition, the publication indicates prevailing commission scales for various products, and includes suggested manufacturer-manufacturers' representative contract forms.

The book is sold on a ten-day unconditional, money-back guarantee basis.

Abnormal waveforms

"101 Key Troubleshooting Waveforms for Horizontal AFC-Oscillator Circuits," by Bob Middleton. Published by Howard W. Sams and Co., 1720 E. 38th St., Indianapolis 6, Ind., 128 pages, 151 illustrations, $2.00.

This book, which is designed for any technician who has ever been puzzled by an abnormal waveform, shows 101 abnormal waveforms, and compares them to normal waveforms when various circuit components go bad.

Circuit systems, tests, and evaluations of results complement the illustrations. Supplementary notes provide much background information. The book covers the three most popular horizontal AFC-oscillator configurations—the multivibrator and blocking oscillator with pulse-width AFC, and the multivibrator with duo-diode AFC.

Electro-Mechanical Strength is just one of three vital requirements for Service Entrance switches. The other two: Operating Performance and Load-Break Dependability. Specify the switch that's proven in these areas.

The Pringle LOAD BREAK Switch for Service Entrance duty was tested for these minimum standards. Electro-Mechanical Strength sample: switches closed against maximum station short circuits (130,000A. 510V.)—no damage! Another: switches were subjected to maximum station (110,000A. 610V.) for 5 full cycles—again, no damage.

See the proof yourself. Send today for the fully detailed Report on the recent series of tests. Just ask for Test Report Bulletin P-112.

Pringle ELECTRICAL MANUFACTURING COMPANY

1908 N. SIXTH ST., PHILADELPHIA 22, PA.

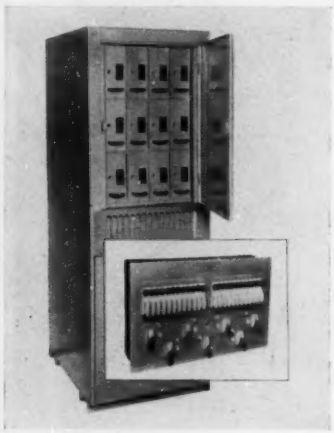
For more details on above items, use reply card on page 21

New products

Kliegl rectifier dimmers

Kliegl Bros., 321 W. 50th St., New York, N. Y., has recently announced Underwriters' Laboratories listing for the SCR dimmer in four-, five-, and six-kw capacities.

The patented silicon-controlled rectifier dimmer, first introduced by Kliegl in 1958, will also be available



in three-, ten-, and 12-kw capacities within the immediate future.

Users will like the compactness of SCR dimmers which requires less space to house the units. Self-contained fans in the dimmer rack make it unnecessary for users to provide for cooling the banks.

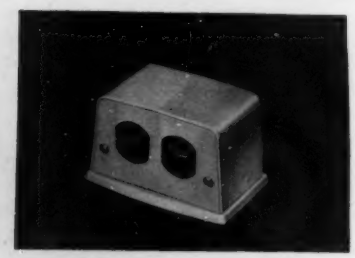
Because of great installation flexibility, these dimmers may be located remotely or incorporated as a part of lighting control consoles or cross-connect circuit selection systems.

Write P-721 on reply card, pg. 21

Adam floor box outlet

A new series of ultra-modern silhouette floor-box service fittings has recently been announced by Frank Adam Electric Co., 3650 Windsor Pl., St. Louis 13, Mo.

Called Lo-Boy, and designed to conform to the crisp, functional lines of modern commercial and institutional furnishings, the new fittings are less than three inches high when installed flush to the floor.



The Lo-Boy housing is made up of three aluminum die-castings: top shell, base, and front plate. It is internally reinforced for greater than normal mechanical strength. The assembly, after wiring connections are made, takes only a few seconds by sliding the top shell into the grooved base and fastening the front plate with two screws. A 1¼-inch diameter nipple makes firing fast and easy. A hard, baked-on satin-aluminum epoxy resin finish has high resistance to scuffs and abrasion.

To satisfy the requests of contractors, Lo-Boy fittings are individually packaged unassembled.

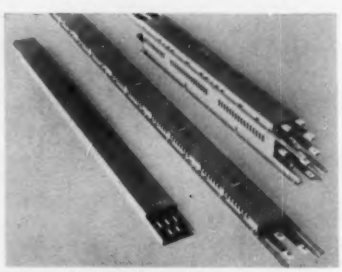
Write P-722 on reply card, pg. 21

EDP Uni-Bus busways

An improved line of Uni-Bus feeder and plug-in busways featuring a new type of construction called Poly-air Insulation is announced by Electric Distribution Products, Inc., 2200 31st St., S.W., Allentown, Pa., a division of Worthington Corp.

The new construction provides four major benefits: (1) higher insulation efficiency, (2) greater inherent safety, (3) lower weight, and (4) increased resistance to damage from electrical stresses or improper handling.

It is now standard on the Uni-Bus line of busways which consists of various types of low-impedance in-



sulated bus bar systems, designed for complete electrical and mechanical interchangeability and for the encouragement of safe electrical practice.

Available in ratings from 60 to 4,000 amperes, Uni-Bus busways are fully enclosed sources of light and power supply which are tapped through standardized plug-in connections. These connections, or outlets, feature an exclusive mechanical interlocking safety device which makes accidental contact with a conductor impossible.

Write P-723 on reply card, pg. 21

Sangamo wall time switch

Precision time switches built in flush mounting steel cases are announced by the Sangamo Electric Co., 11th and Converse Sts., Springfield, Ill.

Ideally suited for switchboard, wall, or panel mounting, these switches provide a wide variety of time control functions for industrial or commercial applications. Both straight synchronous and synchronous-carryover models are available.

The flush mounting case has a door which may be adapted for either right- or left-hand opening. It is supplied with a lock which may be installed by removing a knockout on the door. The flush case is made of 16 gauge steel.

Weight of the unit is 10½ pounds

with a type L synchronous switch, and 11 pounds with a type W synchronous-carryover switch.

Write P-724 on reply card, pg. 21

Guth swing mount troffers

New troffers from Edwin F. Guth Co., 2615 Washington Blvd., St. Louis 3, Mo., feature swing mounting brackets to simplify installation and save on troffer installation costs.

The company now features a complete variety of troffers that will fit almost every specification requirement. New 4¾-inch shallow models come in two- and four-foot widths. Other units in ½- and one-foot widths are available. All units come in two-, four-, and eight-foot lengths, are separately fused, and include CBM/ETL ballasts.

All units have a tough, durable finish of 300-degree baked-on Acrylic paint, Units are U.L. listed.

A wide variety of bottoms includ-

ing Gratelite louver diffuser and Prismoid Gratelite are available. Swing mounting brackets are preset for height of ceiling support members, and released by tripping clip from inside the troffer then hooked over the support. Final adjustment to the troffer is made by turning adjustment screws to draw up the troffer trim flush with the ceiling.

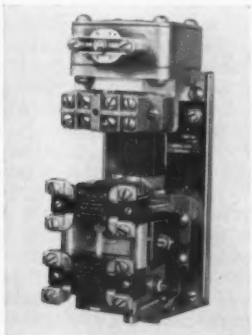
Write P-725 on reply card, pg. 21

Square D timing relays

Class 9050, types B and C timing relays, made by the Square D Co., Dept. SA, 4041 N. Richards St., Milwaukee 12, Wis., are now available with a new two-pole snap switch which doubles the number of contacts and mounts in the same space as a single-pole timer.

The new device is designed for applications where normally it would be necessary to install an extra timer or relay for control of additional circuits.

The new timing relay can also be furnished with one or two single-pole double-throw instantaneous snap



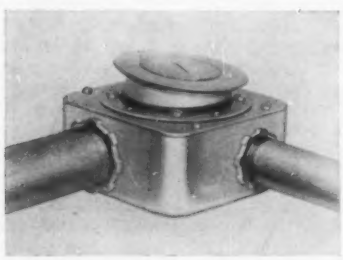
switch interlocks, and is easily converted from on-delay to off-delay and vice versa. Timing is adjustable from 0.2 seconds to three minutes, and contacts are totally enclosed to avoid dust and dirt problems.

The timers are available for both a-c and d-c operation and in a wide variety of enclosures for any application.

Write P-726 on reply card, pg. 21

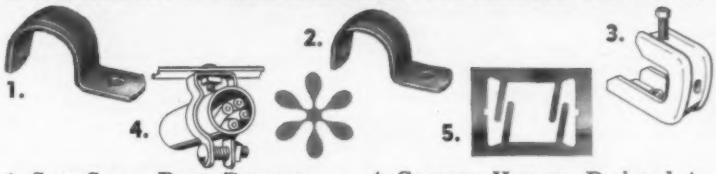
Thomas & Betts floor boxes

A new floor box line, which solves a variety of installation problems, has been introduced by the Thomas



COMPARE*

Blackhawk's **HOLDING AND FASTENING FITTINGS**



1. SNAP-STRAP RIGID CONDUIT — 700. The original snap on clamp that snaps tighter and holds its grip. Sizes: ⅜" to 2"

2. SNAP-STRAP FOR THINWALL CONDUIT — 1700. Same style as 700 line, except they are made to fit Thinwall conduit. Sizes: ½" to 2"

3. BEAM CLAMP. Complete with case hardened set screw. Fits up to ½" thick beam flange. ¼-20 tapped holes.

4. CONDUIT HANGER. Designed to hold thinwall and rigid conduit. ¼" hole in the base permits use with toggle bolt, wood screw or anchor. Complete line of sizes.

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Atlanta Warehouse: C. C. MYRICK, 516 Elm St., N. W., Atlanta, Georgia

& Betts Co., 36 Butler St., Elizabeth, N. J.

These floor boxes have 13 knockouts, including eight in-line, in a variety of sizes to cover the conduit range from ½ to 1¼ inches. For greatest wiring area, the boxes are 4-11/16 inches square. A minimum box height of 2⅛ inches is available which makes it ideally suited for even the most shallow floors.

Designed for concrete floors, box adjustment to floor height and level can be made vertically up to ⅝ inch and tilted as much as ten degrees in any direction—all in one operation. Flexible gaskets keep the box concrete-tight, eliminating the need for grouting or other sealing devices.

Made of steel with bronze face plates, the box is designed to accept a wide variety of standard receptacles to match any plug-in requirement. The face plate has no exposed screws, which gives a quality finish to the installation. As an extra added feature, the box can be adjusted, if necessary, after pouring concrete.

Write P-727 on reply card, pg. 21

Sola lamp transformers

A new single-lamp and two-lamp mercury transformer especially designed for high ambient temperatures has been designed by Sola Electric Co., Busse Rd. at Lunt, Elk Grove, Ill., a division of Basic Products Corp.

The new transformers have been designed for use in industrial areas where temperatures are higher than recommended for the standard designs.

Class B insulation and special capacitors insure perfect operation and long life in ambient temperatures up to 55 C. Areas where such temperatures are encountered such as foundries, boiler rooms, and steel treating areas can readily be served without the necessity for remote mounting of the transformers.

Sola's proven constant-wattage principle is a standard feature in the new transformers, insuring a regulated, safe power flow to the lamps.

In practice, the constant-wattage design limits starting current during lamp warmup. Lamp wattage and light output is maintained in spite of line voltage fluctuations that may be as great as plus or minus 13 per cent. Lumen output is held constant within approximately plus or minus one per cent.

Write P-728 on reply card, pg. 21

Miller fluorescent unit

A new fluorescent fixture adapted to a wide variety of special wall mounting lighting applications has been announced by the Miller Co., 99 Center St., Meriden, Conn.

Because it makes use of two lighting components, up and down, either independently or jointly depending upon the lighting needs of the location where it is mounted, the new fixture is called the Miller Multi-Purpose Wall light.

A salient design feature of the unit is that it makes three distinct types of lighting available from a

single unit. When both downward and upward components are used, a desirable balance of comfortable general illumination with direct reading or work light is obtained.

Up light only provides general room lighting that will be comfortable even to bedfast patients looking up at the ceiling. Down light only permits reading, working, etc., without lighting up an entire room.

This choice of lighting arrangements makes the light ideal for lighting hospital beds, home study areas, etc.

The fixture is made in two-, three-, and four-foot lengths. Optional features are a four-way pull chain switch, a convenience outlet for electrical appliances, and a night light in upper compartment.

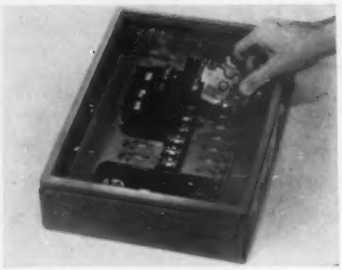
Write P-729 on reply card, pg. 21

Federal Pacific breakers

Federal Pacific Electric Co., 50 Paris St., Newark 1, N. J., has introduced a new line of Stab-lok circuit breakers and enclosures modified to meet the new 1959 NEC Code requirements for non-interchangeability.

The design change, however, does not obsolete existing Stab-lok installations because the new circuit breakers can be used in old or new devices.

Considered among the most practical and simplest of all non-interchangeable devices, the new line is based on a design whereby the breakers are fitted with hardened steel clips that prevent the breaker from



being stabbed in until one or two knock-outs in the enclosure are removed—an operation that can easily be done with a special tool made available only to qualified electrical wiremen.

No additional work at all is required in installing 15- and 20-ampere breakers. They are installed as before—by simply stabbing them in—and the design insures that only 15- and 20-ampere units can be installed in all spare spaces without use of this special tool.

Write P-730 on reply card, pg. 21

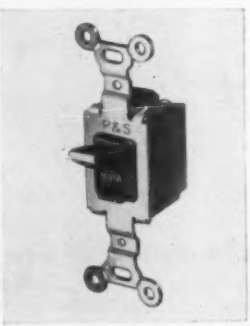
Pass & Seymour switches

Pass & Seymour, Inc., Solvay Station, Syracuse, N. Y., has announced a new and complete line of 20 ampere a-c switches.

Quiet in operation, with binding screw terminals or with pressure terminals, they are available in strap type and Despard interchangeable type.

All have shallow, compact, totally enclosed bodies, which allow ample wiring room in the box. Positive control of the contact arm in both directions is provided. Spring action to open and close the circuit is not necessary.

This type of construction eliminates



sticking and overheating, the principal cause of switch failure, the manufacturer states. They are available in single-pole, double-pole, three-way, and four-way models.

Write P-731 on reply card, pg. 21

S&C load interrupter

A new high-voltage load interrupter switch for metalclad switchgear in industrial and commercial build-

ings has been introduced by S&C Electric Co., 4435 N. Ravenswood, Chicago 40, Ill.

The new three-pole load interrupter switches up to 1,200 amperes, closes on 60,000 amperes when fused, and costs less than most former models that could carry 1,200 amperes but interrupt only 600 amperes.

The new load interrupter switch meets all latest Code requirements for fault closing and has been completely tested at full rating by KEMA Laboratories.

The new switches are more compact than prior 1,200-ampere models, use parallel pairs of blades, have dual contacts, and include integral quick-make, quick-break mechanisms.

Nominal voltage ratings are 4.8, 13.8, and 14.4 kv with a continuous and interrupting rating of 1,200 amperes. Momentary (ten-cycle) rating is 61,000 amperes. Fault-closing rating is 40,000 amperes without fuses and is 60,000 amperes with fuses.

Write P-732 on reply card, pg. 21

G-E low-voltage switches

A new development in low-voltage switching, announced by the General Electric Co., 95 Hathaway St., Providence 7, R. I., makes the G-E remote-control wiring system even more flexible and adaptable for residential, commercial, and industrial installations.

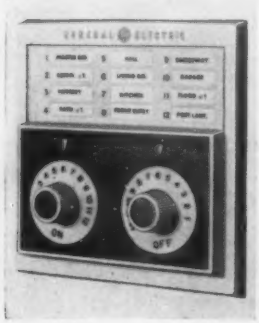
A complete new line of 11 wall switches provide better solutions for today's complex lighting requirements.

Relay centers are available with interchangeable, partially preassembled components for either the standard or new G-E plug-in type relays for easy maintenance and accessibility for future additions or alterations.

Greater flexibility in motorized master units permits unlimited control of lights to meet practically any requirement.

Wall switches are now available in three styles: a new dual pushbutton design offers instant identification, a new locking switch that requires a special key to operate, and a smart new trigger style switch for ease of operation with finger or elbow.

Write P-733 on reply card, pg. 21



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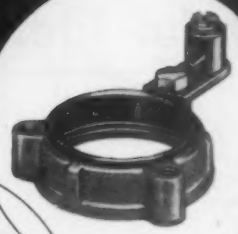

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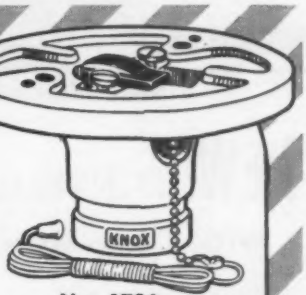

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No. 1924

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available to our readers

A new catalog of **conduit fittings** and accessories is now available from **Bridgeport Fittings, Inc.,** 209 Center St., Bridgeport, Conn. The illustrated catalog contains complete shipping and ordering data.

Write B-734 on reply card, pg. 21

Metal enclosure boxes for electrical junctions and controls are covered in a new catalog released from **James F. Burns Co.,** 1601 Industrial Highway, Pennsauken, N. J. Boxes range from small steel cover boxes to large cabinet panel boxes. Wiring troughs are also covered in the illustrated booklet.

Write B-735 on reply card, pg. 21

Recommended lighting levels for 112 specific areas in the modern hospital are incorporated in a new manual published by **Day-Brite Lighting, Inc.,** 6260 N. Broadway, St. Louis 15, Mo. Called the "Hospital Lighting Manual," the 24-page booklet also contains illustrations of well designed **hospital lighting** installations, a breakdown of the various types of lighting equipment available, and suggested lighting layouts. Every conceivable hospital area is covered, including those which come under patient care, public and traffic, administrative, and service.

Write B-736 on reply card, pg. 21

A four-page illustrated bulletin from **Boston Insulated Wire and Cable Co.,** 63 Bay St., Boston 25, Mass., describes various kinds of **silicone-insulated cable** manufactured by that company. Entitled "Single and Multi-conductor Cable with Silicone Rubber," the bulletin features power and lighting cable, hookup wire, ignition cable, as well as conductor cable for shipboard, missiles, and nuclear power purposes. A second bulletin, "Wire and Cable Application Case Histories," outlines case histories involving silicone rubber cable applications. Case histories involving radiation resistant cables and miniaturized switchboard wires using silicone rubber insulation are discussed in it.

Write B-737 on reply card, pg. 21

Now available from **General Electric Co.,** 1 River Rd., Schenectady 5, N. Y., is bulletin 6175C, a 16-page revised edition including a comprehensive outline of the essentials of efficient, economical **floodlighting.** The bulletin describes floodlight classifications and general principles of floodlighting applications, telling how to calculate light levels in floodlighting both vertical and horizontal surfaces. Included are sample problems and solutions, recommended footcandle levels for various applications, and photometric data for floodlights equipped with filament and mercury lamps.

Write B-738 on reply card, pg. 21

Details of a new plan that will simplify planning, **product purchasing,** and sales programming for residential builders are discussed in a new booklet, B-8219, "New Direction in New Profit for Builders: Westinghouse Residential Marketing Plan," now available from **Westinghouse Electric Corp.,** P. O. Box 2278, Pittsburgh 30, Pa. The 24-page booklet covers each aspect of the plan, including the line products designed to sell houses in quantity.

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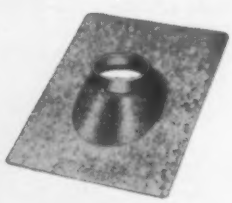

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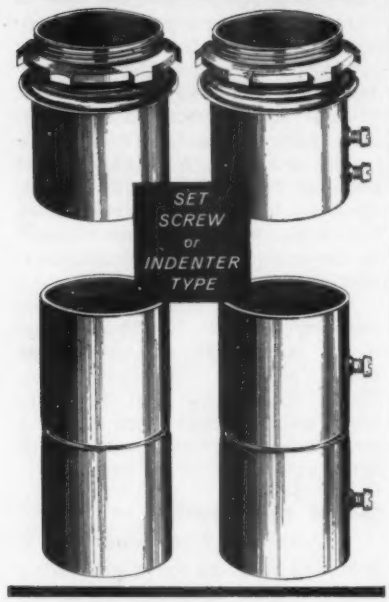

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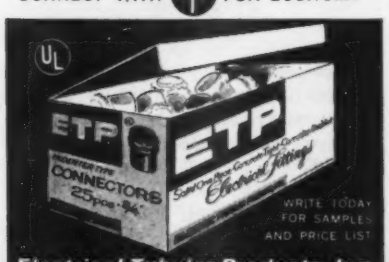

Electrical Tubular Products, Inc.

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DEfender 5-8000

REPRESENTED BY: Florida: Electra, 3150 N. W., 40 St., Miami; Texas & Okla.: Brenner Elec., Box 51, Houston; N. C., S. C. & Va.: Robert Winfrie, Box 1744, Annapolis, Md.; Miss. & La.: F. C. Baldridge Co., 302 Eureka Bldg., New Orleans 12.

The illustrated booklet covers electric heating in particular detail, and includes a guide for computing the economies of electric heating.

Write B-739 on reply card, pg. 21

A variety of economical **wiring devices** especially developed for the low cost residential market is pictured and fully described in a new eight-page, two-color catalog (C-101) now being offered by the **Bryant Electric Co.,** Box D, Barnum Station, Bridgeport 2, Conn. Including switches, outlets, receptacle covers, wall plates, and lampholders, the catalog gives package weights and price per 100 on all items in this "Beco" line. Descriptions of each unit list colors available as well as other special features.

Write B-740 on reply card, pg. 21

A recently published price book is now being offered by the **Arrolet Corp.,** Bower St., Montgomery, Pa. The company's complete line of **outlet boxes,** box supports, and covers is included in the illustrated listing (No. SB-161). The price book is designed for distributors, contractors, and estimators.

Write B-741 on reply card, pg. 21

The **Arrow Conduit & Fittings Corp.,** 108-20 180th St., Jamaica, N. Y., has just issued an illustrated price book covering every item in their line of **outlet boxes,** covers, and box supports. Distributors, contractors, and estimators will find this new price book very easy to use and to follow.

Write B-742 on reply card, pg. 21

A new catalog on all models of Mears **circuit breakers** is being offered by **Mears Controls, Inc.,** P. O. Box 3798, Portland 8, Oreg. This colorful catalog is color-coded, and gives a general description of the Mears type "H" air circuit breakers and type "F" fused circuit breakers, plus detailed application data. This last section is of particular interest to consulting engineers and electrical contractors, inasmuch as it gives tables of current ratings, short circuit currents, motor starting duty, and control circuit data.

Write B-743 on reply card, pg. 21

The Great Western Fuse Div., El-Tronics, Inc., Jamestown, N. Y., has recently issued an 11-page booklet of informational data on the **dual element fuses** the company offers. Included are graphs giving load data, diagrams showing material features of the fuses, and ordering information. A cross reference guide giving sizes and ratings is also included.

Write B-744 on reply card, pg. 21

A newly released folder from **Sierra Electric Corp.,** 15100 S. Figueroa St., Box 85, Gardena, Calif., gives illustrated ordering data for the company's type 302 stainless steel

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A 2 part Tin Lid is provided for top concrete pouring. The cut-away picture above shows top adjusting section with brass cover-plate and two tin lids exposed.

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This clamp is made with a double safety bite of case hardened tool steel. Two models—Right Angle and the Parallel support. Each model comes in 11 sizes to handle pipe or conduit ⅜" thru 4". Edge Type Clamps ½" thru 3".

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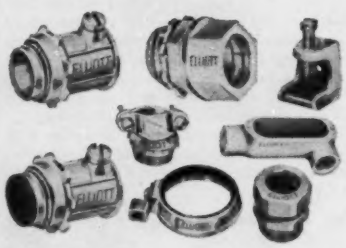

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wall plates. The folder describes the highly corrosive resistant plates, useful around chemicals or acids.

Write B-745 on reply card, pg. 21

"The ABC's of Regulators," an elementary treatise on single-phase, 32-step **distribution regulators,** is now available from **Line Material Industries,** 700 W. Michigan St., Milwaukee 1, Wis. This bulletin, No. 61052, has basic diagrams, rating tables, and calculation examples.

Write B-746 on reply card, pg. 21

Regulation analysis

(Continued from page 56)

primary can fall nine per cent and the customer's voltage will be restored to normal. Therefore, at this substation the minimum voltage limit on peak will be 95 per cent volts which is nine per cent below normal.

In a similar manner, the "minimum load, maximum voltage limit" was obtained. All of the buck taps were used when a normal system voltage of 102 per cent was applied at the transformer terminals. Therefore, at this substation the maximum voltage limit for minimum loading is 102 per cent volts.

Voltage profiles were also plotted for substations B and C located at other points on the transmission system in Figure 1. These profiles are shown in Figures 3 and 4, respectively. The transformer turns ratio differs at substation B, and substation C serves a 12.46-kv system and has an LRC range which differs from transformers at substations A and B. Even with this variation in circuit voltages, turns ratios, and LRC ranges; nearly equal voltage limits are obtained at each location.

Voltage profiles should be obtained at each substation on the system so that fixed taps can be selected to give common voltage limits to achieve the greatest utilization of the automatic tap changer, and to furnish the information necessary for establishing system voltage operating schedules.

Relay protection

(Continued from page 53)

This relaying is described with the relaying on circuit No. 24-15 at Greensboro Main.

At Greensboro Main Substation OCB No. 24-15 is equipped with pilot wire relaying in addition to the conventional time delay with instantaneous attachment relays. This pilot wire relay provides instantaneous clearing of line faults for the entire length of the line.

The instantaneous attachments are set to reach 90 per cent of the length of the line and are in service on all operations. The time delay relays coordinate with the station relays at Market Street Substation. This breaker is one-shot, instantaneous, reclosing.

The relay schemes described have been in service for two to three years. The protection is considered adequate. Some time settings are longer than desired, but are necessary because of several series-connected sectionalizing devices (see Figure 3).

The problem of high current settings on ground relays exists because of line-to-neutral loads. Currently, no changes are planned in the relay protection on this system.

Future plans include the addition of several 100/24-kv stepdown substations for supplying areas adjacent to Greensboro. These substations will probably feed radial circuits with relaying schemes similar to those now in use at the Greensboro Main.

Code application

(Continued from page 44)

provided with an extra grounding conductor, be connected to terminals in an approved manner and supported by clamps or other approved means so that there will be no strain on the terminal connections, and be provided with suitable seals to prevent the entrance of dust where the cords enter enclosures which are required to be of the dust-ignition-proof type.

Paragraph (a) of Section 502-13 requires receptacles and attachment caps to be dust-ignition-proof approved for Class II locations and be designed for connection of the grounding conductor.

Paragraph (b) of this section requires such receptacles and attachment caps to be designed for connection of the grounding conductor and to be so designed that connection to the supply circuit cannot be made or broken while live parts are exposed.

Answers to Code test questions: (1. **T** Section 502-7-b-2) (2. **F** Section 502-7-b-3) (3. **T** Section 502-8-a) (4. **T** Section 502-8-b) (5. **F** Section 502-10-b-1) (6. **c** Section 502-10-b-2) (7. **a** Section 502-11-a-1) (8. **a** Section 502-11-b-2) (9. **a** Section 502-11-b-1) (10. **b** Section 502-12).

Voltage regulators

(Continued from page 62)

provide a constant voltage regardless of load at some point on the feeder.

This means the voltage at the output terminal of the regulator will vary with the load. Excessive compensation resulting in high regulator output voltage could damage equipment that is close to the regulator.

After the compensator settings have been calculated and applied to the regulator, it is good practice to check the loadcenter voltage to make sure that these settings give the proper results.

Correct compensation will give more economical system operation and customer satisfaction. Because both factors can mean increased revenue, proper use of compensation should be seriously considered by utility engineers and executives.

New impact wrench

(Continued from page 49)

This means that it is no longer necessary to withdraw the bit at intervals and remove the clogged wood. The hole through a pole may be drilled all the way without stopping.

(5) Impact drilling is much faster (see (4) above).

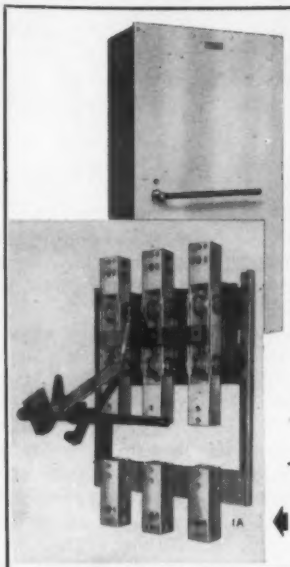
(6) Savings are quite obvious, but have not been accurately determined by time studies. It is safe to say, however, that, like other mechanization innovations adopted by Louisiana Power & Light Co., the application of powered hand tools to the jobs mentioned will result in net annual savings ranging from one-half to two times the total cost of the tools.

This means that the tools pay for themselves in from six months to two years, depending on their application and how much of the time they are kept busy. In our case, we believe they will pay for themselves in something like nine to 12 months.

(7) The safety of providing men with the proper tools for the job is well established and drilling with impact wrenches is no exception. For instance:

(a) See (3) and (4) above—This means a man may drill a hole in a pole without having to position himself behind the drill, resisting the torque normally encountered when drilling with an electric drill.

(b) He has no concern about the bit becoming bound in the hole by



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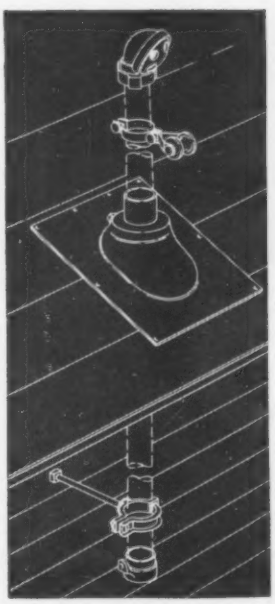

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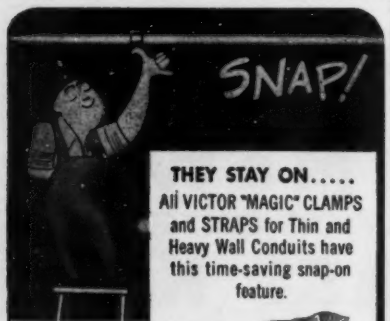

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clogging and twisting itself out of his hands and very possibly causing a bad accident. In fact, a man can easily drill a hole in a pole at a right angle to his position with one hand.

Advertising sells

(Continued from page 34)

three days before we could get the wires through the basement and raise them from one level to the next.

In some homes difficulty arises in placing the ground wire where it will get approval. This, too, calls for a "snaking" job. We have had to raise the wire by bringing it outside the house and going from window to window. In one case we had to go up ten feet and sleeve it off the ground, using US cable.

In the house shown in the accompanying pictures we had some difficulty wiring from the old loadcenter to the new and drilled holes from the basement to the first floor. Cutting holes in the wall to get cable into the bottom of the cabinet, we were then able to extend circuits down into the basement.

In most cases where heavy-ups are recommended, homeowners recognize the need and permit us to go ahead with the job. Generally the only people who hold out are those not ready to make the investment. As I have already stated, national advertising has educated the public to the benefits of ample housepower, and thereby helped the contractor to do a more effective selling job.

We require a 50 per cent down payment and collect the other 50 per cent on completion of the job. We handle no credit paper. When the question of credit arises, we advise our customer to approach sources that make such loans.

Maintenance

(Continued from page 32)

working in a supermarket on a changeover that resulted from one of these coffee checks," said Mr. Horn.

Maintenance work is not only a means to keep a foot in the door, it provides an assured monthly income.

"Maintenance bills are paid every 30 days, and the money can be turned right back into operating capital," Mr. Horn explained. "And there are no collection problems or expense."

In and out of business places, Horn Brothers found that their maintenance customers appreciate the thoughtfulness in dressing their personnel in uniforms.

"We get our uniforms, fitted to the individual, from a rental service. The rental charge which we pay includes laundering, and each serviceman is issued a fresh uniform daily."

While Horn Brothers keeps acquiring new maintenance accounts, they are unable to make them exceed 30 per cent to their total. Other work keeps pace, and the ratio remains almost constant.

"We like our maintenance work so much," said Mr. Horn, "we'd like to get it up to where it constitutes as much as 70 per cent of our total. With maintenance work, there's no standby time to absorb while a contractor ahead holds us up waiting on some small part that had to be specially ordered."

Horn Brothers Electrical Contractors came into existence by taking over this phase of the business from the Bauman Electric and Neon Company about a year ago, where Robert Horn was then employed.

"We are firm believers in advertising," Thomas Horn concluded. "We believe it pays us to keep our name before the public.

"Too, we enjoy remembering our regular and prospective customers on their birthday with an executive type gift."

Service brings success

(Continued from page 30)

the users dispute the lighting recommendations of the contractor or lighting engineer. Too often the contractor may be diffident about approaching the owner or architect or he may not have the courage of his convictions to stand up to his own concepts of best lighting for a specific application.

But the importance of direct contact with the owner or architect must be stressed. It is the only way for the contractor intent on bettering his profits and circumstances through quality lighting to approach professional status.

By advising and by projecting constructive ideas that result in dollars and cents benefits every hard-headed businessman understands, he'll earn the reputation of being a lighting expert and consultant.

It hasn't been too long ago that it was commonly the province of the electrical contractor to sell

and install and make a good profit on a lighting installation and its components. Where fixtures are concerned, and with the advent of mail order and discount houses and the chains who can easily undersell him, today's contractor has a priceless advantage stemming from his experience.

He has the know-how or he can get it by assiduous study of available lighting literature, and he can sell lighting *service*, an area in which he excels his chain store competition by far.

That way he can help stem their infiltration into his profits.

NECA bookkeeping

(Continued from page 31)

any other figure shows the bookkeeper he is off somewhere.

Mr. Bavousett, who has been bookkeeper for the firm for 11 years, said he was "apprehensive to say the least" when his boss installed the new system. "I came to work one day and there it was," he said. "It is a complicated machine when you start learning it; it took me about two months to really get it down right. But it was worth it."

A man from the Monroe company spent a week training the bookkeeper in the intricacies of the new mechanical mind.

Charles Nelson Electric Company is the first contractor in the Lubbock area to try the new system, but others are becoming very interested.

"We wouldn't think of going back to the old system," said Mr. Bavousett.

Headquarters lighting

(Continued from page 26)

In the conference room, the overhead specially-designed six-foot recessed fixture consists of two- by two-foot lenses and contains six six-foot fluorescent lamps. Switching is arranged in thirds to provide either 40, 80, or 120 footcandles for the conference table.

It was found that two lamps overhead make the best arrangement for conference rooms, other than those requiring close paper work. By illuminating the wall cove, an over-all, pleasing effect is attained, without excessive contrast.

In the accounting department, stem-hung shielded fixtures were used, giving over 100 footcandles at desk level. Corridors are illuminated by either surface or recessed incandescent units. In the

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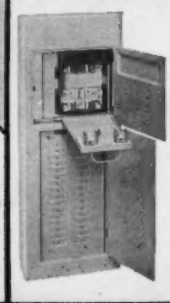
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main corridors fluorescent lighting is used because of long lamp life. These fixtures remain in operation 24 hours a day, doubling as night lights, as does an incandescent light.

However, to get longer incandescent lamp life, a silicone-oxide, rectifier toggle switch is used which gives full illumination in one position and approximately half illumination in the other position. This quadruples the lamp life of a normal 1,000-hour lamp.

No two offices have the same fixtures. They may utilize the same basic layout but where one has recessed units the other could have either surface or stem-hung equipment.

Church lighting

(Continued from page 27)

sharp contrasts. The installation has been much discussed at regional IES conferences, and has won two regional awards.

The new First Baptist Church in Waxahachie is also a source of pride for its congregation. Soon after opening it became apparent that by night its off-the-main-street location presented some problems.

One of these was the lack of identity for the location, with only simple lanterns marking the doors at the tower entrance. Another problem was the matter of safe walking as people left the well-lighted church interior to return to their parked cars.

Solution to both problems was provided with a rather simple system of floodlighting. By strategically locating five groups of three 300-watt PAR 56 floods (and a pair of the same near the tower) the facade of the building was presented effectively, but without ostentation.

The groups of flood lamps were aimed to provide enough spill light to illuminate the sidewalks around the property.

Washington report

(Continued from page 10)

the U. S. Department of Labor reports.

The increase was the highest in the building and construction trades. Average hourly pay for a journeyman was $4.09.

Highest rate was $4.65 an hour at Los Angeles, Calif., and the lowest was $3 an hour at Burlington, Vt.

The Department surveyed 100 of the largest cities.

The rates are the minimums. They exclude holiday and vacation payments made directly to workers each pay period. Also excluded are fringe benefits.

AF protests subsistence allowance of electricians

THE AIR FORCE protested a new $5 subsistence allowance for electricians at the vast Cape Canaveral base.

This protest was the first for President Kennedy's new Missile Sites Labor Commission. The commission was set up last month to handle labor disputes at missile bases in the wake of Senate McClellan Committee disclosures of Cape Canaveral electricians earning as much as $670 a week and $11,000 to $25,000 a year.

With the establishment of the commission, the AFL-CIO unions pledged not to strike missile bases.

McClellan Committee hearings focused so much attention on IBEW Local 756 at Cape Canaveral that it negotiated a contract renewal with the Daytona Beach division of the National Electrical Contractors Association.

The contract limits overtime to 20 hours a week. Electricians can work only one shift in 24 hours. On urgent assignments, the union will supply enough electricians to prevent excessive overtime.

Contractors increased pay for shifts after 4 p.m. from $3.85 an hour to $4.43.

In addition, the contract renewal added a subsistence clause to which the Air Force objected:

"On all jobs considered to be inaccessible, and that are not serviced by adequate public transportation, or room and board in the immediate vicinity of one mile is not available at a reasonable rate, under such circumstances the employer will pay to each man employed under the terms of this agreement $5 per day subsistence when an employee employed under the terms of this agreement works less than nine hours per day.

"This subsistence pay will be paid for any part of a day or any shift in case of shift work, and will be in addition to the pay that a man may receive."

The Air Force figures that this is an unwarranted cost to be added into its contracts. The union says that this pay is in lieu of travel pay or nine-hour work guarantees that are common for work involving considerable travel.

AT THE HEART OF THINGS

This 20th anniversary of the U. S. Savings Bonds program is an important milestone for the 45,000 companies, large and small, which offer the Payroll Savings Plan to their employees. Payroll Savings is the heart of the bond program, and the means by which millions of families have seen dreams realized since 1941. It has been good for business and industry... good for local communities... good for the nation's economic welfare. Above all it is good for the citizen who sees in each Savings Bond a share in his country's future.

If yours is one of the 45,000 participating companies, this anniversary year offers a good reason for renewed promotion. For help and suggestions, contact your State Savings Bonds Director, or write: **U. S. Savings Bonds Division, Treasury Department, Washington 25, D.C.**

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ADVERTISER'S INDEX

A

Allis-Chalmers Mfg. Co. 67, 69
American Metal Moulding Co. 85
American Steel & Wire Div., U. S. Steel Corp. 8, 9

B

B & C Metal Stamping Co. ...46
Blackburn Corp., Jasper 5
Blackhawk Industries 85
Bridgeport Fittings, Inc. 2
Bulldog Electric Products Div., I-T-E Circuit Breaker Co. 6, 37
Bussmann Mfg. Co. ..Back Cover

C

Circle Wire & Cable Co. 39
Classified Ads 94
Copperweld Steel Co. 59

D

Davis Mfg. Co. 71

E

Electrical Tubular Products...89
Electri-Flex Co. 93
Elgo Shutter & Mfg. Co. 88
Elliott Electric Mfg. Corp. 90
Estimating Handbooks Associates 93
Evans Metal Co. 88

F

Fanner Mfg. Co. 65
Fasco Industries, Inc. 7
Fullman Mfg. Co. 89

G

G & W Electric Specialty Co. 73
Gedney Electric Co. ..... Inside Front Cover
General Electric Co., Large Lamp Department 17
Globe Co. 98

H

Helwig Carbon Products, Inc. 90

J

Joslyn Mfg. & Supply Co. 57, 63

K

Kearney Corp., James R. 56
Kelek Co. 91
Knox Porcelain Co. 87

L

L & P Lighting 11, 12

M

M & W Electric Mfg. Co. 91
Massey, Inc., A. H. 98
Minneapolis-Honeywell Regulator Co. 15

N

Norris Thermador Corp., Thermador Electrical Mfg. Co., Div. 78

P

Paragon Electric Co. 92
Phelps Dodge Copper Products Corp. 70
Pringle Electrical Mfg. Co. 83

R

Rattan Mfg. Co. 87
Republic Steel Corp. 35
Revere Electric Mfg. Co. 14
Royal Electric Corp. 45

S

Southern States Equipment Corp. 68
Southwire Co. 1
Square D Company .....Inside Back Cover
Sta-Brite Fluorescent Mfg. Co. 80
Steel City Electric Co. 16

T

Thermador Electrical Mfg. Co. 78
Tomic Sales & Engineering Co. 72

U

U. S. Steel Corp., American Steel & Wire Div. 8, 9

V

Victor Specialties 92

W

Wadsworth Electric Mfg. Co. 94
Want Ads 94
Weaver Co., J. A. 13

Y

Youngstown Sheet & Tube Co. 18, 19

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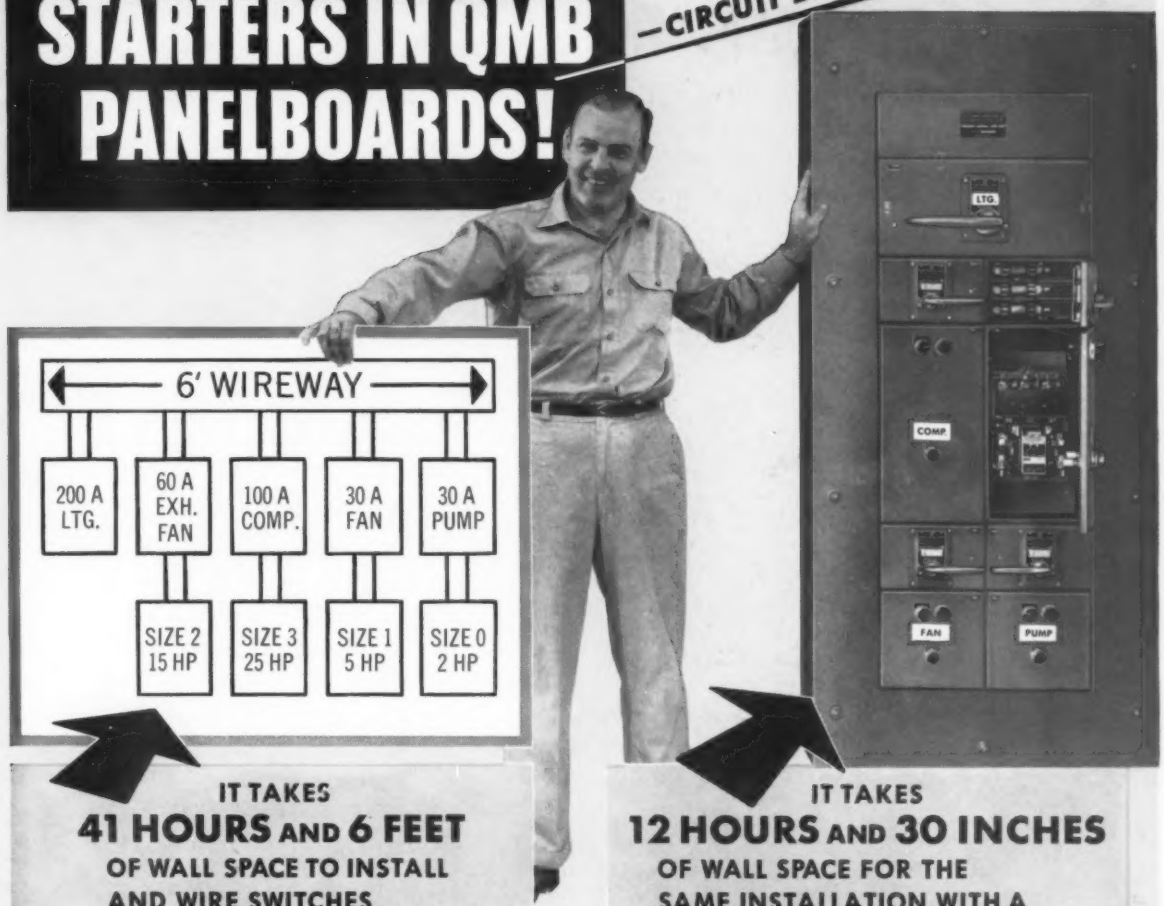

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- Combine switch and breaker units in same panelboard, if desired

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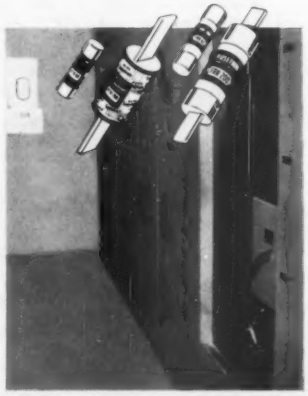

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